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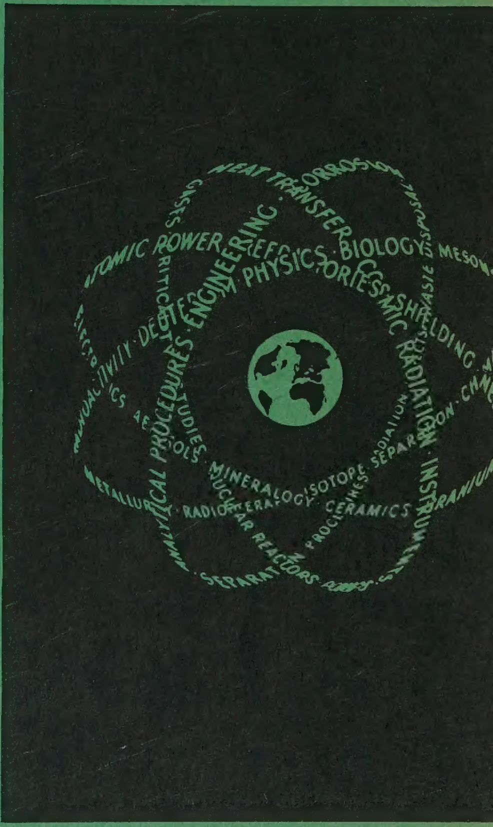

September 15, 1959

Volume 13 Number 17
Abstract 14947–15820

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NUCLEAR SCIENCE ABSTRACTS

Volume 13 Number 17 September 15, 1959

GENERAL

14947 NP-7609
Denmark. Atomenergikommissionen, Roskilde.
REPORT OF THE ACTIVITIES OF THE DANISH ATOMIC ENERGY COMMISSION FOR THE PERIOD FROM APRIL 1, 1957 TO MARCH 31, 1958. Dec. 1958. 63p.

The activities of the Danish Atomic Energy Commission from April, 1957 to April, 1958 are summarized. The erection of buildings of the Risø Research Establishment is described. The operation of the DR−1 is reported. The reactor fuel consists of a solution of water containing uranium-235. Construction problems during the erection of the DR−2 are reported. Technical and scientific activities during the period are reviewed and a list of publications during the period is included. (C.H.)

14948 NP-7632
European Organization for Nuclear Research, Geneva.
ANNUAL REPORT—1958. 82p.

CERN activities for 1958 are reviewed. The synchrocyclotron is now in full operation, and the proton synchrotron is making steady progress in its construction phase and should be in operation in 1960. The structure of CERN is given, and the site and buildings are shown. Activities, theoretical studies, proton synchrotron, synchrocyclotron, and technical services are discussed. Expenditures for 1958 and the 1959 budget are given. CERN publications and reprints are listed. (For 1957 Annual Report see NP-6822.) (W.D.M.)

14949 SCTM-119-59(51)
Sandia Corp., Albuquerque, N. Mex.
CRATER STUDIES—DESERT ALLUVIUM. B. F. Murphey and H. R. MacDougall. May 1959. 14p. Contract [AT(29-1)-789]. $3.30(ph), $2.40(mf) OTS.

A series of ten underground explosions of 256-pound centrally detonated TNT spheres was conducted to extend underground high explosion tests in desert alluvium from one to four λ and to compare the results with data from other media. Results are tabulated and illustrated photographically. (C.H.)

14950 TID-5059(4th Rev.)
Technical Information Service Extension, AEC.
CORPORATE AUTHOR ENTRIES USED BY THE TECHNICAL INFORMATION SERVICE IN CATALOGING REPORTS. Fourth Revised Edition. Frances E. Stratton, ed. July 1959. 142p. $2.75(OTS).

14951
SOME EXAMPLES OF PROBLEMS POSED TO INDUSTRY BY THE CONSTITUTION OF NUCLEAR REACTORS. Pierre Vachet (Recherches et d'Essais Physiques, Paris). p.115-31 of "Journées d'Information sur l'Énergie Nucléaire, 14-15-16 Janvier 1957." Documents, Suppl. to No. 114. France, Commissariat General à la Productivité. 1957. 203p. (In French)

The construction of reactors requires a number of materials of high purity, some of which until recently were known only in the laboratory. The production and industrial processing of aluminum, magnesium, beryllium, beryllium bronze, titanium, zirconium, tantalum, niobium, graphite, rare earths, uranium, and thorium are briefly reviewed. (J.S.R.)

14952
INTERNATIONAL ATOMIC POLITICS. Bertrand Goldschmidt (Commissariat à l'Énergie Atomique, Paris). p.177-84 of "Journées d'Information sur l'Énergie Nucléaire, 14-15-16 Janvier 1957." Documents, Suppl. to No. 114. France, Commissariat General à la Productivité. 1957. 203p. (In French)

The history of the development of atomic energy is composed of two phases: the first, that of atomic secrets, was from 1943 to 1954, and the second, that of controlled international agreements, was initiated in 1954. The atomic alliance of the Anglo-Saxon countries, the Baruch Plan, and the failure of secret policies during this first period are discussed. The new American policies calling for an international agency of atomic energy initiated the second phase. Parallel to this development, bilateral agreements for the peaceful use of atomic energy were made with friendly governments. The International Atomic Energy Agency, its agreements, and extent of control are discussed. The possible role of Euratom in international atomic policies is reviewed. (J.S.R.)

14953
NUCLEAR RESEARCH IN BRAZIL. Krystyna Kowalska. Nukleonika 4, 66-80(1959). (In Polish)

A review is given of the nuclear research and nuclear energy program in Brazil. (R.V.J.)

14954
IMPROVEMENTS IN THE STEAM GENERATORS OF NUCLEAR POWER INSTALLATIONS. Andre Huet. British Patent 814,057. May 27, 1959.

A tube-header arrangement is described which permits easier access to a given group of tubes. A group of tubes and their sub-headers can be disconnected and rotated into a lock chamber for removal, replacement, or examination. The arrangement also permits easier initial assembly. (T.R.H.)

14955

ELEVATING MECHANISM. H. S. Frederick and M. A. Kinsella (to U. S. Atomic Energy Commission). U. S. Patent 2,874,852. Feb. 24, 1959.

An elevator is described, which is arranged for movement both in a horizontal and in a vertical direction so that the elevating mechanism may be employed for servicing equipment at separated points in a plant. In accordance with the present invention, the main elevator chassis is suspended from a monorail. The chassis, in turn supports a vertically moveable carriage, a sub-carriage vertically moveable on the carriage, and a turntable carried by the sub-carriage and moveable through an arc of 90° with the equipment attached thereto. In addition, the chassis supports all the means required to elevate or rotate the equipment.

14956

DETECTOR FOR TELEPHONE SURREPTITIOUS LISTENING TECHNIQUES. E. D. Hightower (to U. S. Atomic Energy Commission). U. S. Patent 2,875,285. Feb. 24, 1959.

An apparatus is described for attaching to a telephone to detect any attempt to wire-tap using the telephone microphone as a source of voice modulation. The approach taken is to continuously monitor the voltage across the microphone only when the telephone disconnect switch is actuated. If a voltage is detected, a device is operated to give a warning.

BIOLOGY AND MEDICINE

14957 ACRH-11

Argonne Cancer Research Hospital, Chicago.

SEMIANNUAL REPORT TO THE ATOMIC ENERGY COMMISSION. Leon O. Jacobson and Antreen Pfau, eds. Mar. 1959. 103p. Contract AT(11-1)-69. $2.50 (OTS).

Data are summarized from a series of recently published papers which indicate that the tissue iron enzymes as well as the blood hemoglobin level play a role in the iron-deficiency state. Results from a study of the derivation, role, and fate of the antibody-forming cell in the rat indicate that antibody-forming cells in lymph nodes may be released to circulate in the efferent lymph and peripheral blood. Evidence indicates that the circulating cells may still contain formed antibody. Because of their form these circulating elements are designated lymphocytes. Strong evidence also implicates the plasma cell in the immune phenomenon. It appears that the circulating blood contains two small round cells, one produced in the germinal centers of the spleen and other lymphatic tissue and having no known relationship to antibody production, while the other is apparently produced in the splenic red pulp, contains antibody, and is related intimately to antibody synthesis. In terms of site of production and function the two cells appear unrelated. Papers included which have been accepted for publication cover the effect of concurrent feeding of Tween 80 on the carcinogenicity of orally-administered 3-methylcholanthrene, data on the long-term survival of irradiated mice treated with homologous tissue suspensions, a new modality in brachytherapy based on isotopes decaying by electron capture, the distribution of intraperitoneal radiocolloids, acquired tolerance to mouse leukemia in rats, and the determination of metabolites of cardiac glycosides in human urine. A list of staff publications during the period is included. (For preceding period see ACRH-10.) (C.H.)

14958 AD-138146

Chicago. Univ.

STUDIES WITH INTERMEDIARY METABOLITES IN TOTAL-BODY IRRADIATED RATS. Progress Report [for] December 1, 1956–July 31, 1957. Lloyd J. Roth. 24p. Contract DA-49-007-MD-514.

The role of urea in metabolism in irradiated animals and other disease states was investigated with urea labeled with carbon-14. Data are included on the metabolism of carbon-14 labeled glucose. An apparatus was developed for wet combustion of biological samples. The apparatus can convert samples to a state suitable for counting by a Geiger-Mueller counter, scintillation counter, or ionization chamber. (C.H.)

14959 AD-149895

Rochester, N. Y. Univ. School of Medicine [and Dentistry].

EFFECT OF IONIZING IRRADIATION OF FAT AND PROTEIN ON THEIR DIGESTION IN VIVO. E. S. Nasset. Final Report [for] June 1, 1955–May 31, 1957. 27p. Contract DA-49-007-MD-60-619.

Lard and lean beef were irradiated in a beam of accelerated electrons (6 million rep in a Van de Graaff apparatus). Test meals were fed to dogs, using all possible combinations of irradiated and unirradiated lard and meat. Irradiated lard, whether fed by itself or with meat, was retained in the stomach to a greater extent than normal lard, filled the small intestine to a smaller extent, and was less readily absorbed in a specified time. The peroxide value of lard rose abruptly on radiation to 176, and in 14 months of cold storage continued to rise to over twice this value. It is concluded that irradiation of lard is determental so far as its digestion in the dog is concerned. Free amino acids were determined in the intestinal contents after feeding various test meals. Irradiation of meat failed to alter the relative concentration of 18 free amino acids. As the result of feeding various mixtures of crystalline amino acids it was demonstrated that it is extremely difficult to change the amino acid pattern in the gut contents and hence any alteration in beef muscle protein that might have been produced by irradiation was probably masked. On the evidence here available it is concluded that irradiation of lean beef does not interfere with its digestion in the dog. (auth)

14960 AD-161492

Utah State Univ., Logan.

STUDIES ON RADIATION PRESERVATION OF FRUIT AND VEGETABLES PRODUCTS. Report No. 6 (Annual) [for] December 1, 1956–November 30, 1957. L. H. Pollard and D. K. Salunkhe. 106p. Project No. 7-84-01-002. Contract DA 19-129-QM-821.

A study was made of the effects of radiation dose, radiation rate, storage period, and can condition on flavor and chemical changes in irradiated fruits and vegetables. Data are included on yellow sweet corn, tomatoes, carrots, onions, potatoes, pears, cherry delight, apricot and peach nectars, peach halves, asparagus, cabbage, strawberries, and string beans. (C.H.)

14961 AD-201667

Swift and Co. Research Labs., Chicago.

THE EFFECT OF SUB-STERILIZING DOSES OF CATHODE RAYS AND GAMMA RAYS ON THE KEEPING QUALITIES OF PORK. Progress Report No. 5 [for] August 16, 1957—November 15, 1957. W. M. Urbain. 10p. Project No. 7-84-01-002. Contract QMR & D (Natick) No. 2.

Beef steaks were broiled to various internal temperatures between 125 and 180°F prior to gamma irradiation at 2.8M and 4.6M rads. After irradiation, samples were stored at 40 and 100°F and examined at monthly intervals for bacteriological and sensory properties. Uncooked steaks were also treated. The steaks held at 40°F were again cooked and checked for flavor, aroma, and tenderness. The steaks held at 100°F were inspected but not tasted. Ionizing radiation of 2.8 and 4.6M rads reduced the bacterial population in all instances to less than 10 per gram. No increase in bacterial population occurred after storage at 1 and 2 months at 40 and 100°F. The flavor of all irradiated samples was markedly inferior to the non-irradiated controls. Pre-cooking had little effect on the flavor scores. Those steaks irradiated with 4.6M rads were slightly inferior to those irradiated with 2.8M rads. The aroma of all irradiated steaks was greatly inferior to that of the untreated frozen controls. Pre-cooking or amount of radiation had little effect on the average aroma scores. Tenderness of all irradiated steaks was greater than the unirradiated controls. This effect was less noticeable in the case of the steaks pre-cooked at 180°F. (auth)

14962 AD-201849

Whirlpool Corp. Research Labs., St. Joseph, Mich.

EVALUATION OF SHELF LIFE OF IRRADIATED FOOD. Progress Report No. 6 [for] November 1, 1957—January 31, 1958. Aaron L. Brody. Project No. 7-84-01-002. Contract QMR & D(Natick) No. 49.

Results are reported from a study of the refrigerated shelf life of a number of irradiated foods. Data are included on shrimp, asparagus, snap beans, strawberries, sour cherries, blueberries, and lima beans. Surface irradiation did not retard ripening or cause significant organoleptic changes on hard ripe Elberta peaches, Kiefer or Bartlett pears, or Wealthy apples. The skin color of Double Red Delicious apples was adversely affected by refrigerated storage subsequent to irradiation. (C.H.)

14963 AD-202550

Sloan-Kettering Inst. for Cancer Research, New York.

STUDY OF THE POST-IRRADIATION SYNDROME IN HUMANS. Period covered: November 1, 1957—January 31, 1958. James J. Nickson. Mar. 1, 1958. 8p. Contract DA-49-007-MD-910.

Two patients with disseminated cancer but considered to be in good medical condition received total-body radiation. Both patients were followed and the post-irradiation syndrome carefully scrutinized. In the case of the first patient, for whom this was the second course of radiation, there was no appreciable change in the platelet count during three months subsequent to her irradiation. The patient is currently being followed at monthly intervals. The second patient showed hematologic depression following irradiation and developed bleeding diathesis on the third week post-irradiation. Protamine sulfate was given to the patient on the 26th post-irradiation day to alleviate this condition but in spite of this unfortunately the patient expired on the 32nd day post irradiation having developed acute pulmonary edema. Work is continuing on the study of cell membrane actively following total-body irradiation. Urinary excretion patterns following total-body irradiation is also being checked as an index of radiation exposure. (auth)

14964 AD-202585

American Can Co., Barrington, Ill.

EFFECT OF RADIATION ON CAN ENAMELS. Progress Report No. 2 [for] November 29, 1957—January 28, 1958. D. H. Johns and G. B. Pratt. 9p. Project No. 7-84-01-002. Contract DA-19-129-QM-968.

The preparation of 300-can packs of both cherries and chili-con-carne in specially prepared controlled plate cans with promising enamel systems is described. The initial and three-month examinations of irradiated and thermally processed cans are reported. (J.E.D.)

14965 AD-202662

Massachusetts. Univ., Amherst.

DETERMINATION OF PIGMENT CHANGES OCCURRING IN IRRADIATED PLANT PRODUCTS DURING POST-IRRADIATION STORAGE. Report No. 6 (Final) [for] September 11, 1956 to September 10, 1957. F. J. Francis. 134p. Project No. 7-84-01-002. Contract DA-19-129-QM-742.

Four vegetables irradiated at 1.86 megarads were packed under 21 different conditions and analyzed at five periods up to one year of storage. Data are presented on the chlorophyll, pheophytin, carotene, and xanthophyll content for green beans and broccoli, and the total carotenoids, xanthophyll, beta-carotene and alpha-carotene for sweet potatoes and carrots. The reflectance, hue and chroma for each product as well as the pigment-free residues are also presented. Some studies on apple products, pectin gels, organic acid-sugar systems and hydroxymethylfurfural are included. (auth)

14966 AD-202663

Massachusetts Inst. of Tech., Cambridge.

STUDIES OF THE FUNDAMENTAL PHYSICAL AND BIOLOGICAL CHANGES THAT OCCUR AS A RESULT OF RADIATION TREATMENT OF FOODS RESULTING IN MODIFICATIONS OF FLAVOR, COLOR AND TEXTURE. Report No. 11 (Final) [for] September 1, 1955—April 20, 1957. B. E. Proctor. Includes Addendum by B. E. Proctor, S. A. Goldblith, J. Wertheim, R. Roychoudhury, and J. Hoff. 194p. Project No. 7-84-01-002. Contract DA-19-129-QM-522.

Progress is reported in an investigation of the fundamental physical and biological changes that occur as a result of radiation treatment of foods, resulting in modifications of flavor, color, and texture. Data are presented on off-flavor formation and chemical changes in irradiated milk and milk components. Irradiation off-flavors, derived from milk lipids, were shown to be produced within the fat without interaction with the aqueous phase and were of the same character and magnitude when derived from anhydrous butterfat as from the emulsified fat in milk. It was also found that the off-flavor becomes considerably more pronounced when irradiated milk fat or fractions thereof were tasted after being re-emulsified in milk. Data are included from studies on the precursors of radiation-induced off-flavor in butterfat, radiation-induced browning in milk and sugar solutions, the elimination of off-flavor retention in irradiated milk by concurrent distillation, the influence of irradiation on rennet coagulation time, the relation of temperature to the radiosensitivity of lipase in milk, and the effect of temperature on radiation-induced flavor changes. 59 references. (C.H.)

14967 AD-202813

Oregon Agricultural Experiment Station, Corvallis.

INCREASING THE ACCEPTANCE OF IRRADIATED MEAT AND MEAT PRODUCTS BY SELECTED TREATMENTS BEFORE, DURING, AND FOLLOWING IRRADIATION. Report No. 6 (Annual) [for] January 1, 1957–January 26, 1958. H. W. Schultz. 23p. Project No. 7-84-01-002. Contract DA19-129-QM-836.

Irradiated chili-con-carne, beef stew, and beef with noodles were evaluated by a large taste panel and were compared with thermally-processed controls. All the irradiated foods scored lower than the controls. The effect of a number of additives on the flavor were tested. Results are summarized. (C.H.)

14968 AD-203115

Heinz (H. J.) Co., Pittsburgh.

THE EFFECT OF VARIOUS LEVELS OF IRRADIATION DOSAGE UPON THE HEAT RESISTANCE OF FOOD SPOILAGE ORGANISMS. (STRAINS OF CLOSTRIDIUM BOTULINUM.) Progress Report No. 3 [for] October 25, 1957–January 24, 1958. I. J. Hutchings. 11p. Project No. 7-84-91-002. Contract QMR&E (Natick) No. 79.

The-rate-of-reduction-in-spore-resistance of spores of Clostridium botulinum in condensed cream of chicken soup exposed to irradiation dosage from 502,200 to 2,008,800 rads has been determined and when plotted on semi log paper with the D values on the log scale and the dosage in rads on the linear scale gives a straight line exponential reduction in resistance curve. (auth)

14969 AD-208454

Baylor Univ., Houston, Tex. Coll. of Medicine and Jefferson Davis Hospital, Houston, Tex.

A STUDY OF THE EFFECTS OF TOTAL AND PARTIAL BODY RADIATION ON IRON METABOLISM AND HEMATOPOIESIS. Progress Report for Period September 1, 1958–November 30, 1958. V. P. Collins, C. T. Teng, and W. D. West. 20p. Contract DA-49-007-MD-428.

Results are reported from a study of the response of red blood cell count and hemoglobin levels to three types of interference that may be looked upon as traumatic stimuli. These include plasma transfusion, extracorporeal circulation of blood, and irradiation of blood in extracorporeal circulation. These represent different magnitudes of trauma. Transfusion is minimal, extracorporeal circulation somewhat greater, and irradiation of blood in extracorporeal circulation seems distinctly to add an additional factor to injury. Injury is followed by recovery. For a more severe injury, recovery tends to achieve levels above initial values for hemoglobin and red blood cell counts. Whether the addition of irradiation in these experiments represents merely quantitatively greater trauma, or whether it is qualititively different trauma, is not established. The observation of similar prolongation of depression and recovery in dogs transfused with irradiated plasma does permit the possibility that blood irradiated in extracorporeal circulation does sustain injury beyond that due to the mechanical procedure alone. (auth)

14970 AD-209570

Johns Hopkins Univ., Baltimore. McCollum-Pratt Inst.

EFFECTS OF HIGH LEVELS OF IONIZING RADIATION ON ANIMAL TISSUES. Progress Report No. IX [for] March 1–August 31, 1958. Kenneth J. Monty and David Gambal. 11p. Contract DA-49-007-MD-631.

An investigation was made of the mechanisms underlying the retarded rate of digestion and absorption of irradiated lipids. A number of carbonyl compounds of the type found in irradiated meats were found to inhibit lapase. Data are included on the influence of fatty aldehydes on the absorption of lipid. (C.H.)

14971 AD-211233

American Can Co., Barrington, Ill.

EFFECT OF RADIATION ON CAN ENAMELS. Progress Report No. 4 [for] May 29, 1958–July 28, 1958. G. B. Pratt and A. C. Wilbur. 2p. Project No. 7-84-01-002. Contract DA-19-129-QM-968.

Codfish with and without enzyme inactivation was packed in experimental enameled cans and stored for irradiation at a later date. For cans of irradiated chili, cherries, and beef, some enamels did not appear adversely affected after several months' storage. (auth)

14972 AD-211306

Sloan-Kettering Inst. for Cancer Research, New York.

STUDY OF THE POST-IRRADIATION SYNDROME IN HUMANS. Period of Report: November 1, 1957–October 31, 1958. James J. Nickson. 28p. Contract DA-49-007-MD-910.

Four patients with nearly normal physiologic condition received five courses of total-body irradiation of calculated absorbed doses from 50 to 150 r at midplane, and one of the patients also received internal irradiation from sodium-24. Physiological alterations resulting from irradiation were studied. Alterations in the formed elements of the circulating blood were found to be the most consistent index of radiation effect. Data are included on changes in creatin-creatinine excretion ratios, pentose excretion rate, and properdin levels. (C.H.)

14973 AECU-4145

Los Alamos Scientific Lab., N. Mex.

BIBLIOGRAPHY ON THERAPY OF RADIATION INJURY. Ruth M. Hendrickson, comp. [1958]. 14p. Contract [W-7405-eng-36]. (D-BIB-28). $3.30(ph), $2.40(mf) OTS.

The literature from 1948 through 1958 was searched for references on the therapy of radiation injury. (C.H.)

14974 AMRL-307

Army Medical Research Lab., Fort Knox, Ky.

BLOOD AND URINE TYROSINE LEVELS IN STARVED X-IRRADIATED RATS. A. J. Luzzio, J. G. Kereiakes, and G. Sutton. Nov. 12, 1957. 13p. Project No. 6-59-08-014. (AD-146283).

A study of tyrosine levels in the blood and urine of starved control and starved x-irradiated rats revealed alterations in protein metabolism due to a restricted food intake. The results suggest that protein catabolism is inhibited due to the radiation syndrome. There was no evidence to substantiate the occurrence of protein degradation by the methods used in this study. (auth)

14975 AMRL-313

Army Medical Research Lab., Fort Knox, Ky.

A HIGH LEVEL COBALT 60 IRRADIATION FACILITY FOR RADIOBIOLOGICAL RESEARCH. James G. Kereiakes, Jack M. Ginsburg, and Adolph T. Krebs. Dec. 5, 1957. 23p. Project No. 6-59-08-014. (AD-149023).

A recently installed high-level cobalt-60 irradiation facility for radiobiological research is described. The source output, measured in air, is 95 r/min at a source-specimen distance of 40 cm. The LD_{50} for rats with this gamma radiation facility is 795 r. Dose measurements and required shielding for a specific application to massive-dose partial-body irradiation studies are given. (auth)

14976 NM-62-02-00.01.01
Naval Medical Research Inst., Bethesda, Md.
THE USE OF SMALL LABORATORY ANIMALS IN MEDICAL RADIATION BIOLOGY. V. COMPARATIVE LETHAL EFFECT OF 200, AND 2,000 KVP X- AND Co^{60} GAMMA RAYS IN GUINEA PIGS. F. Ellinger, E. B. Cook, and J. E. Morgan. Apr. 3, 1957. 30p. (AD-154456).

The lethal effect of doses of ionizing radiation varying between 325 and 750 r/air produced in guinea pigs exposed to x rays generated at 200 and 2,000 KVP and Co^{60} gamma radiation under different conditions of geometry and scatter was studied. A graphic presentation of the results using mortality as ordinate values and doses as abscissa resulted in a series of distinct S-shaped curves. A definite influence of the type of radiation as well as of exposure geometry on mortality has been found, indicating that exposure to Co^{60} gamma in 4π geometry was the least effective. Mortality studies were correlated with ionization measurements in phantoms and frozen guinea pigs. It appears that the larger or smaller amount of secondarily produced radiations seems to be an important factor in determining mortality. Significance of these data for the extrapolation to man of animal experimental data is discussed. The need for a common factor or factors which will permit significant application of animal data to man with respect to the lethal effect of total-body irradiation is pointed out. Until such a factor or factors have been evolved, it is suggested to exercise utmost caution in the assumption of levels of radiation tolerance in man on the basis of observations made in animals since the latter may err over a wide margin above and below. (auth)

14977 NP-7478
Industrial Bio-Test Labs., Inc., Northbrook, Ill.
THE CARCINOGENIC PROPERTIES OF IRRADIATED FOODS. Progress Report No. 3 [for] September 16, 1958—March 1, 1959. J. C. Calandra and John H. Kay. 4p. Contract DA-49-007-MD-895.

Progress is reported in a study of the possible carcinogenic effects on mice of a diet composed of irradiated codfish, beef stew, chicken stew, green beans, peaches, and flour. Preliminary data are presented. (C.H.)

14978 NP-7492
Georgia. Univ., Tifton. Georgia Coastal Plain Experiment Station.
TO DETERMINE THE EFFECT OF IRRADIATION ON THE WHOLESOMENESS OF FOOD. Progress Report No. 5 for September 15, 1958 to March 15, 1959. M. W. Hale, E. M. Ellis, and D. Sikes. 14p. Contract DA-49-007-MD-780.

No differences due to diet were observed in dogs maintained for 63 weeks on a diet containing 20% dry weight of irradiated cabbage or in dogs maintained for 93 weeks on a diet containing 35% dry weight of irradiated bacon. Data are presented on growth, feed efficiency, hemoglobin, packed cell volume, white blood cell count, and reproduction. (C.H.)

14979 ORINS-25
Oak Ridge Inst. of Nuclear Studies, Inc., Tenn.
THE ACUTE RADIATION SYNDROME. A MEDICAL REPORT ON THE Y-12 ACCIDENT JUNE 16, 1958. Marshall Brucer, comp. Apr. 1959. 182p. $2.50 (OTS).

A description is presented of the medical care of eight patients exposed to whole-body radiation at the Y-12 plant of the Union Carbide Nuclear Company, Oak Ridge, Tennessee, June 16, 1958. Five of the persons received doses in the neighborhood of 300 rads and three received doses between 20 and 70 rads. The changes following irradiation were not complicated by any trauma or superimposed high-level skin irradiated. A general account of the hospital care is presented; medical developments are described; results are presented of serial hematological, biochemical, and other studies for a 60-day period; and individual case histories are included. It is pointed out that there is no specific therapy for acute, severe radiation damage since there is no specific major pathology. All the treatment is symptomatic and the physician must refrain from doing anything that might do damage to the patient. Discussions on the acute radiation syndrome and personnel radiation monitoring from a criticality accident are included. The patients in the low-dosage group were dismissed from the hospital after 10 days, and the patients in the higher-exposure group were dismissed from the hospital on the 44th post-accident day, and were followed for a time as outpatients. (C.H.)

14980 PB-131951
California. Univ., Los Angeles.
EFFECT OF IONIZING RADIATIONS ON THE NUTRITIVE AND SAFETY CHARACTERISTICS OF FOODSTUFFS. Report No. 10 (Final) [for] January 28, 1955—December 31, 1956. J. F. Mead and W. H. Griffith. 22p. Project No. 7-84-01-002. Contract DA-19-129-QM-265. $0.75(OTS).

A series of pure esters, vegetable oils, and animal fats were tested for peroxide increase following irradiation. Very high peroxide numbers developed in the esters. The vegetable oils in general did not develop significant peroxide, while the animal fats developed moderate values, possibly, in some cases, near the upper limit of the range considered safe at the 20% level of dietary fat. (auth)

14981 PB-131952
Massachusetts. Univ., Amherst.
EFFECT OF IRRADIATION ON PIGMENTED FOODS USED IN RATIONS FOR THE ARMED FORCES. Report No. 5 (Final) [for] June 1, 1955—May 31, 1956. I. S. Fagerson. 33p. Project No. 7-84-01-002. Contract DA-19-129-QM-321. $1.00(OTS).

A study was made of the effect of sterilizing doses of radiation on food pigments. An index of discoloration was prepared based on the transmittance of samples as measured spectrophotometrically. The effect of gamma and cathode radiation on the color stability of several sugar-organic acid type browning systems was also measured. Data are included on radioinduced changes in the color in chlorophyll, tomato purees, strawberry juice, strawberry jellies, and carrot puree. The pigments involved are identified. The effects of radiation on uncolored synthetic pectin gels was also investigated. (C.H.)

14982 PB-131957
Massachusetts Inst. of Tech., Cambridge.
DEVELOPMENT OF A METHOD OF RADIATION STERILIZATION OF FOODS WITHOUT ADVERSE FLAVOR AND CHEMICAL CHANGES. Report No. 11 (Final) [for] September 1, 1955—April 20, 1957. B. E. Proctor. 134p. Project No. 7-84-01-002. Contract DA-19-129-QM-521. $2.75(OTS).

Results are summarized from a series of tests on the wholesomeness of a number of irradiated foods held at various temperatures ranging from 50°F to 125°F. The foods included chicken meat, green beans, halibut, beef liver, beef steak, hamburger, pork sausages, scallops, spinach, and sweet potatoes. (C.H.)

14983 PB-131958
Oregon. Agricultural Experiment Station, Corvallis. INCREASING THE ACCEPTANCE OF IRRADIATED MEAT AND MEAT PRODUCTS BY SELECTED TREATMENTS, BEFORE, DURING, AND FOLLOWING IRRADIATION. Report No. 8 (Final) [for] October 23, 1955—December 31, 1956. H. W. Schultz. 59p. Project No. 7-84-01-002. Contract DA-19-129-QM-554. $1.75(OTS).

Tests were made by a taste panel on the acceptability of irradiated bacon, ground beef, beef and pork roasts, T bone steaks, canned pasteurized hams, pork chops, spaghetti and meat balls, beef stew, beef and gravy, pork and gravy, six prepared meat products, meat balls and gravy, chili-con-carne, noodles and beef, corned beef hash, and beef stew. Results are presented. The effects of various temperatures, methods of preparation, and additions of antibiotics were also tested. (C.H.)

14984 UCRL-8708
California. Univ., Berkeley. Lawrence Radiation Lab. THE EFFECTS OF INDOLEACETIC ACID AND KINETIN ON THE GROWTH OF SOME MICROÖRGANISMS (thesis). David Kennell. Mar. 31, 1959. 70p. Contract W-7405-eng-48. $2.00(OTS).

Data are presented from a study of the effects of indoleacetic acid and kinetin on the growth of Amoeba proteus, Escherichia coli, and two species of yeast. Data are tabulated and reaction mechanisms are discussed. 95 references. (C.H.)

14985 UR-542
Rochester, N. Y. Univ. Atomic Energy Project. STUDIES ON THE TOXICOLOGY OF AURIN TRICARBOXYLIC ACID. W. L. Downs, J. K. Scott, E. A. Maynard, H. C. Hodge, L. J. Leach, J. M. Taylor, and R. D. Coye. Feb. 27, 1959. 35p. Contract W-7401-eng-49. $1.25(OTS).

The acute and chronic toxicity of a relatively pure (90%) preparation of aurin tricarboxylic acid (ATA) has been studied in several animal species. The acute toxicity of ATA, administered in single doses to the rat, rabbit, or mouse by several routes of administration, was relatively low. The lethal dose varied from 0.48 to 3.0 gm/kg depending on the species and route used. When ATA was injected intravenously in mice one hour after a previous intravenous injection of beryllium a marked reduction in deaths due to acute beryllium poisoning was observed. Rats exposed to atmospheres containing high concentrations of ATA for periods as long as 20 hours showed no evidence of a toxic response. Repeated daily intraperitoneal injections of ATA in rats at dosages of 30 mg/kg or greater resulted in some hematological changes. No evidence of toxicity was observed in rats which ingested for a 6-month period diets containing concentrations of ATA as high as 1%. Dietary concentrations of 3 or 5% of ATA produced hematological changes without affecting growth or producing tissue injury. Rats fed a diet containing 10% ATA for a 49-day period failed to grow. Moderate to severe injury to the kidney glomerulus was observed when dogs were treated with ATA at doses of 2 or 20 mg/kg administered every other day for a period of one year. (auth)

14986 UR-545
Rochester, N. Y. Univ. Atomic Energy Project. FIELD STUDIES OF FISSION PRODUCT INHALATION. PART II. MOBILE FIELD FACILITIES. Robert H. Wilson. Mar. 27, 1959. 25p. Contract W-7401-eng-49. $0.75(OTS).

In order to facilitate biological experiments in the field, three 35-foot van body trailers were outfitted as mobile laboratory and animal space. The laboratory trailer is equipped with water, air conditioning, extensive bench and storage space, and large well counters. The animal trailers are also equipped with water and air conditioning, as well as dog and rat cages and auxiliary power plants for over-the-road operations. These units have proved quite satisfactory for biological field studies. (auth)

14987 UR-550
Rochester, N. Y. Univ. Atomic Energy Project. ADRENAL ANTIBODIES AND CORTICOSTERONE SECRETION IN THE RAT. F. T. Brayer, A. P. Casarett, and I. L. Spar. May 12, 1959. 6p. Contract W-4701-eng-49. $1.80(ph), $1.80(mf) OTS.

A study was made on the effects of rat adrenal antibodies produced in rabbits on the secretion of corticosterone from the rat adrenal gland. Within the limitations of the data no significant difference in the secretion rate of corticosterone was found among the control and the antibody injected rats. (auth)

14988 WRAIR-76-57
Walter Reed Army Medical Center. Inst. of Research, Washington, D. C.
THE EFFECTS OF WHOLE-BODY RADIATION ON HEMORRHAGIC SHOCK. Joseph A. Preston and Maurice B. Feinstein. June 1957. 12p. Project No. 6-59-12-022. (AD-151794).

Male albino rats of an inbred strain were subjected to sublethal doses of whole-body radiation. They were then subjected to hemorrhagic shock which, in itself, was nonlethal on either the first, fifth, tenth, or twentieth day postirradiation. The response to hemorrhage, as well as the ultimate survival of the animals, was studied. It was found that there was a mutual enhancement of the radiation effect and the sensitivity to hemorrhagic shock. This enhancement was most noted in animals subjected to hemorrhagic shock during the second and third week postirradiation. There was no alteration in the response to shock or radiation in the group of animals subjected to shock on the first day postirradiation. This potentiation occurs during the recovery phase from irradiation and does not seem to be related to endogenous bacteremia or the suppression of the white blood count or red cell mass resulting from whole-body irradiation. (auth)

14989 WT-1467
Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex.
BLAST BIOLOGY—A STUDY OF THE PRIMARY AND TERTIARY EFFECTS OF BLAST IN OPEN UNDERGROUND PROTECTIVE SHELTERS. D. R. Ricmond, R. V. Taborelli, I. G. Bowen, T. L. Chiffelle, F. G. Hirsch, B. B. Longwell, J. G. Riley, C. S. White, F. Sherping, V. C. Goldizen, J. D. Ward, M. B. Wetherbe V. R. Clare, M. L. Kuhn, and R. T. Sanchez. Feb. 1959. 67p. Project 33.1 [of] OPERATION PLUMBBOB. $1.75(OTS).

Dogs, pigs, rabbits, guinea pigs, and mice were exposed to nuclear detonations in two open underground partitioned shelters. The shelters were of similar construction, and each was exposed to separate detonations. Each inner chamber filled through its own orifice; thus four separate pressure environments were obtained. An aerodynamic mound was placed over the escape hatch of each structure to determine its effect on the pressure-curve shape inside the chamber. In one test a sieve plate bolted across the top of the mound was evaluated. Wind protective baffles of solid plate and of heavy wire screen were installed in the shelters to compare primary and tertiary blast effects on dogs. The shelters also contained static and dynamic pressure gages, radiation detectors, telemetering devices, and, in one test, air-temperature measuring instruments, dust-collecting trays, and eight pigs for the biological assessment of thermal effects. One dog was severely injured from tertiary blast effects associated with a maximal dynamic pressure (Q) of 10.5 psi, and one was undamaged with a maximal Q of 2 psi. Primary blast effects resulting from peak overpressures of 30.3, 25.5, 9.5, and 4.1 psi were minimal. The mortality was 19 per cent of the mice exposed to a peak pressure of 30.3 psi and 5 and 3 per cent of the guinea pigs and mice exposed to a peak pressure of 25.5 psi. Many of the rabbits, guinea pigs, and mice sustained slight lung hemorrhages at maximum pressures of 25.5 and 30.3 psi. Eardrum perforation data for all species, except mice, were recorded. Following shot 2, thermal effects were noted. Animals of the groups saved for observation have died from ionizing-radiation effects. (auth)

14990 JPRS(NY)-L-434
CHANGES IN THE MORPHOLOGICAL PICTURE OF THE BLOOD OF YOUNG RATS OF VARIOUS AGES IN ACUTE RADIATION SICKNESS. T. V. Fokina. Translated from Med. Radiol. 2, No. 6, 26-36(1957). 21p. (PB-141333-T). $0.75(OTS).

This paper was previously abstracted from the original language and appears in NSA, Vol. 12, as abstract No. 5167.

14991 NP-tr-241
THE EFFECT OF CHRONIC GAMMA IRRADIATION ON THE OVARIES OF MICE. E. N. Kopylova. Translated by J. B. Sykes (U.K.A.E.A., Atomic Energy Research Establishment) from Izvest. Akad. Nauk S.S.S.R., Ser. Biol. 592-6(1958). 14p. $3.30(ph), $2.40(mf) JCL or LC. (Figures omitted, handwritten MS. copy).

Chronic irradiation with small doses of gamma radiation ranging from 0.05 to 0.4 r/day, resulted in an increase in degenerate follicles in the ovaries of female mice. The percentage increased with the irradiation dose. The chronic irradiation did not cause tumor formation in the ovaries, but in some cases proliferation of the germinal epithelium and lutein stroma was observed. (C.H.)

14992 PB-11230
PRINCIPLES OF BIOLOGICAL ACTION OF RADIOACTIVE RADIATION. B. N. Tarasov. Translated from p.3-138 of Osnovy Biologicheskogo Deystviya Radioaktivnykh Izlucheniy. Moscow, 1954. 115p. $2.50 (OTS).

A review is presented of recent studies on the biological action of ionizing radiations. The nature of the interaction of radiation with matter is discussed. Other topics discussed include the magnitude of absorbed energy at which biological effects are produced; the mechanism of the primary action of radioactive radiation; the indirect action of radiation; secondary reactions to radioinduced damage; the effects of biological action on the penetration of radioactive substances into the organism; and the distribution within the organism and the action of biologically active radioisotopes. 120 references. (C.H.)

14993 TT-800
DIFFERENCES IN THE DEVELOPMENT CAPABILITIES OF F_1 MICE AFTER X-RAYING OF SPERMATOGONIIA AND MATURE AND IMMATURE SPERMATOZOA. (Unterschiede in der Entwicklungsfähigkeit von F_1 Mausen nach Röntgen-Bestrahlung von Spermatogonien, fertigen und unfertigen Spermatozoen.) Paula Hertwig. Translated by D. A. Sinclair (National Research Council of Canada) from Biol. Zentr. 58, 273-301(1938). 48p.

The effect of irradiation on male germ cells at various developmental stages was investigated in mice. The frequency of successful matings and litter size were compared in irradiated and non-irradiated mice. Results of examinations of histological sections of developing germ cells demonstrated the effects of irradiation on various stages of development. (C.H.)

14994
ANOMALOUS DEVELOPMENT INDUCED IN THE EMBRYONIC RAT BY THE MATERNAL ADMINISTRATION OF RADIOPHOSPHORUS. Melvin R. Sikov and Thomas R. Noonan (Univ. of Rochester, N. Y.). Am. J. Anat. 103, No. 1, 137-61(1959) July.

Pregnant female rats were injected intraperitoneally with radioactive phosphorus after 6, 8, 9, or 10 days of gestation and sacrificed at intervals after injection. Gross examinations were made of all the fetuses obtained in these pregnancies. Randomly selected fetuses from each litter were examined histologically. Many cases of anomalous development were found and have been described. When the results of these experiments were compared with those found after acute x irradiation, distinct qualitative and quantitative differences were found. Possible explanation for these have been advanced but at present no single factor can be designated as being responsible for the difference between these two types of irradiation. (auth)

14995
THE EFFECT OF X RADIATION ON CELL METABOLISM. II. THE AFFECTING OF PHOSPHATE AND ENERGY METABOLISM OF ISOLATED TISSUE BY X RADIATION. Klaus Dose and Francesco Bresciani (Max-Planck-Institut für Biophysik, Frankfurt am Main). Biochem. Z. 331, 172-86(1959). (In German)

After x irradiation of isolated muscle tissue (rat diaphragm and frog heart ventricle) with 10 to 120 kr, not only respiration but also the intensity of phosphorylation increases during a first phase. The amount of inorganic phosphate in the cell decreases and more P^{32}-orthophosphate enters the cell from the incubation medium. As a result of the greater intensity of phosphorylation there is a strong increase in the cell content of ATP and ADP. This effect gradually disappears during a secondary phase. X irradiation with quantities larger than 80 kr produces a complete break down of energy metabolism already during the observation period (about 4 to 5 hours). During the first phase (clearly aerobic glycolysis) the amount of stationary intermediary metabolites of glycolysis hardly changes; however, during the second phase it decreases sharply (reduction of the quotient Q_{CO_2}/Q_{O_2}). Immediate decrease in creatine-phosphate concentration results if muscle tissue (diaphragm) is x irradiated. The break down of creatinephosphate is dependent upon muscle contraction. X irradiation with more than 200 kr breaks down the cell metabolism without a preceding increase. Inhibition of the synthesis of other phosphate compounds begins with the break down of energy metabolism (in heart ventricle at 20°C, about 5 hours after x irradiation with 100 kr). All effects appear to be closely connected with a primary disturbance of potassium regulating processes in the cell (loss of potassium from the cell). Potassium controls not only cell respiration, but also phosphate metabolism. There is, however, a quantitative difference between oxygen consumption and ATP synthesis. (auth)

14996

THE EFFECT OF X RADIATION ON CELL METABOLISM. III. THE MODIFICATION OF THE METABOLISM OF ACETATE-2-C^{14} BY X RADIATION (INVESTIGATIONS ON MUSCLE TISSUE). Klaus Dose and Francesco Bresciani (Max-Planck-Institut für Biophysik, Frankfurt am Main). Biochem. Z. 331, 187-94(1959). (In German)

Isolated muscle tissue was x irradiated with 10 to 120 kr. During a first phase after x irradiation there was a strong increase in glycolysis and energy metabolism, but no significant change was observed in the metabolism of incorporated 2-C^{14}-acetate. The metabolism of 2-C^{14}-acetate was disturbed during a second phase (about 2 to 6 hours after x irradiation) when the glycolysis was severely inhibited and the energy metabolism broke down. At the same time there was an almost equal reduction of 2-C^{14}-labelled citrate, succinate, fumarate and malate, as well as of glutamate and asparatate, which are closely connected to the citrate cycle. The disturbance of 2-C^{14}-acetate is caused by interference in the CoA-SH acetylation resulting from an ATP deficiency, and in the inhibition of glycolysis, because the lack of pyruvate, which results from the inhibition of glycolysis causes a deficit in oxalacetate, so that the citrate cycle suddenly breaks down. (auth)

14997

THE SO-CALLED "RECOVERY" PHENOMENON AND "PROTECTION" AGAINST X-IRRADIATION AT THE CELLULAR LEVEL. Roberts Rugh (Marine Biological Lab., Woods Hole, Mass. and Columbia Univ., New York). Biol. Bull. 114, 385-93(1958) June.

The terms recovery and protection in radiobiology are specifically defined. As circumscribed, recovery at the cellular level does not occur following x irradiation damage. Protection simply refers to better survival and in no way implies saving the exposed cell from the sequelae of x irradiation insult. Data are presented from a study of the percentage cleavage and development of sea urchin (Arbacia) eggs at stated intervals following delayed fertilization and following irradiation in cysteinamine, as well as a combination of the two variables. It is concluded that recovery from x irradiation damage defined as restoration of the normal state does not occur even with a delay in insemination. There may be some evidence of chemical nuclear protection to the extent that some eggs can develop to the early pluteus stage, but no further. This is hardly protection in the common usage of the word. It is concluded, therefore, that nuclear damage by x irradiation is irrevocable and irreparable and that neither recovery nor protection, properly defined, occurs at the cellular level following x irradiation damage. (C.H.)

14998

THE BAKING QUALITY AND MALTOSE VALUE OF FLOUR IRRADIATED WITH COBALT-60 RAYS. C. C. Lee. Cereal Chem. 36, 70-7(1959).

Flours treated with 10^6 r showed an increase in H_2O-soluble nonprotein N and a marked adverse bromate effect. Maltose value and gassing power increased with increasing irradiation. Autolytic production of reducing sugars from mixtures of nonirradiated flour and irradiated starch increased with increasing irradiations of the starch. The increase in maltose value for the irradiated flours seem to be due to an enhanced susceptibility of the starch to hydrolysis by β-amylase. (auth)

14999

THE EFFECT OF γ-RAYS OF Co^{60} ON EARLY STAGES OF EMBRYOGENY IN RABBITS. N. I. Nuzhdin and G. V. Nizhnik (Inst. of Genetics, Academy of Sciences, U.S.S.R.). Doklady Akad. Nauk S.S.S.R. 126, 187-90 (1959) May 1. (In Russian)

Data on changes in the early stages of embryogeny in rabbits induced by the exposure of the mother to the single total-body γ doses of 850, 300, and 100 r, shortly before the ovulation, show the high radiosensitivity of ovule cells. The data indicate a reduced number of females with ovulated follicles, a reduced number of fertilized ovule cells, and retardation of early stages of embryo development. (R.V.J.)

15000

ON THE "OXYGEN EFFECT" OBSERVED IN THE CASE OF RADIATION INJURIES IN VEGETABLE AND ANIMAL CELLS. N. I. Shapiro, E. M. Bocharova, and N. V. Belitsina (Inst. of Biological Physics, Academy of Sciences, U.S.S.R.). Doklady Akad. Nauk S.S.S.R. 126, 191-4(1959) May 1. (In Russian)

An attempt was made to show the presence of oxygen effect, not related to aqueous radiolysis, on samples of barley seed and ascitic cells of Erlich carcinomas in mice. Chromosome aberrations were used as the indicators of radiation injuries. (R.V.J.)

15001

FERMENTATIVE OXIDATION OF LIPIDS IN PLANTS EXPOSED TO IONIZING RADIATION. E. V. Budnitskaya and I. G. Borisova (Bakh Inst. of Biochemistry, Academy of Sciences, U.S.S.R.). Doklady Akad. Nauk S.S.S.R. 126, 195-7(1959) May 1. (In Russian)

Effects of x radiation on alterations in free lipid composition of 10- and 14-day sprouts of Latvian bean and Viner barley were studied, and the fermentive nature of peroxide formation in plants was investigated. The tabulated data show strong changes in the plants irradiated with 1000 to 10,000r. It was found that the radioinduced fermentive oxidation in plant lipids increases the content of peroxides which possess toxic properties and specific physiological properties. Further studies should be made of peroxides formed during irradiation of plants and their role and physiological properties. (R.V.J.)

15002

MECHANISMS OF PROTECTION AGAINST GENETIC EFFECTS OF RADIATION. N. P. Dubinin, B. N. Sidorov, and N. N. Sokolov (Inst. of Cytology and Genetics, Siberian Branch of the Academy of Sciences, U.S.S.R.).

Doklady Akad. Nauk S.S.S.R. 126, 400-3(1959) May 11. (In Russian)

Experiments made for determining the protective effects of hyposulfite show that hyposulfite either protects against the HO_2^- radical, the radical does not play an important part in induced ionizing radiogenetic effects, or there exists a certain bond between the ionized and normal state of oxygen molecules with variation in hyposulfite photodynamic effects and x radiation. The experiments on the protective effects of thiourea show that thiourea does not protect chromosomes against photodynamic effects. It was also observed that hyposulfite acts as a luminescence damper. It is known that the luminescence damping is related and follows the process of photoreaction retardation. Preparations of KI, KBr, and hydrochinon were used as protective substances against photodynamic effects. Experiments were carried out with the rivanol and methylene blue. The comparisons of the protective effects of these substances in biological experiments followed the following order: hydrochinon > hyposulfite > I ion > Br ion. Data also showed that those materials capable of protecting against photodynamic effects were not capable of protecting against x radiation and vice versa (thiourea). The effects of photodynamic effect (rivanol) and x radiation on the onion and nigell stability in chromosome rebuilding are tabulated. (R.V.J.)

15003

TOTAL BODY X-IRRADIATION AND NUCLEOTIDE CONTENT OF ISOLATED RAT LIVER CELLS. L. Cima, G. Fassina, and F. Pozza (Università, Padua). Exptl. Cell Research 17, 1-4(1959) Apr.

By employing a spectrophotometric procedure, the influence of total-body x irradiation on the nucleotide content in rat liver isolated cells has been investigated. Quantitative determinations were carried out at various time periods after x irradiation. The variations observed in the free and total nucleotides and in the nucleic acids suggest that ionizing radiations affect the nucleoprotein metabolism by a two-phased course. (auth)

15004

IN VITRO INCORPORATION OF ^{32}P INTO NUCLEIC ACIDS OF LYMPHATIC CELLS. EFFECTS OF X-IRRADIATION AND SOME OTHER AGENTS. A. Sibatani (Yamaguti Medical School, Ube, Japan). Exptl. Cell Research 17, 131-43(1959) Apr.

Lymphatic cells obtained from rabbit appendix were incubated with P^{32} in Tyrode solution for 4 hours. The incorporation into DNA proceeded linearly while that into RNA tended to taper off. The specific activity ratio RNA/DNA thus became much lower for the incorporation during 2 to 4 hours than during 0 to 2 hours of incubation. But if P^{32} was added 2 hours after the start of incubation the RNA/DNA for 2 to 4 hours was as high as that for 0 to 2 hours with P^{32} added at the outset of incubation, suggesting that the rate of RNA synthesis might not change very much during the incubation period of 4 hours. Several metabolic inhibitors affected the incorporation into nucleic acids in both radio-sensitive lymphatic cells and more radio-resistant Ehrlich ascites carcinoma cells incubated under similar conditions; the inhibition for DNA was sometimes much more severe than that for RNA. In contrast, effects of x irradiation (800 r) or hypertonic sucrose solution were markedly dissimilar between the two types of cells. In lymphatic cells, these agents produced a moderate inhibition of incorporation into both DNA and RNA, and the effect became conspicuous only from the second hour of incubation onward. In Ehrlich carcinoma cells the effect of these two agents was not remarkable and probably not specific to nucleic acids. Hypertonic sucrose solution curtailed the effectiveness of x irradiation, but dinitrophenol also had a similar effect. Whether x irradiation and hypertonic sucrose solution have something in common in their mode of action on lymphatic cells therefore remains to be determined. But under the present experimental conditions the effect of these two agents is neither immediate nor specific to DNA synthesis. (auth)

15005

THE EFFECT OF OXYGEN ON THE INDUCTION BY GAMMA RADIATION OF MITOTIC DELAY IN ROOT TIPS OF VICIA FABA. H. J. Evans, G. J. Neary, and S. M. Tonkinson (Atomic Energy Research Establishment, Harwell, Berks, Eng.). Exptl. Cell Research 17, 144-59(1959) Apr.

The influence of oxygen on the induction by gamma radiation of mitotic delay in root tip cells of Vicia faba has been investigated for doses up to about 200 rads. There is no qualitative difference between the radiation effects in anaerobic and aerobic conditions. The oxygen factor, i.e., the ratio of doses required to produce equal mitotic delay under the two conditions is about 1.9 to 2.0. Mitotic delay is greater the earlier a cell is in interphase at the time of irradiation. Cells already in mitosis are not delayed during that mitosis, but suffer a delay in reaching the next mitosis. Various features of the mitotic delay suggest that some unidentified process of cellular development has been disturbed or retarded by irradiation. (auth)

15006

EFFECT OF BONE MARROW AND TISSUE HOMOGENATES ON DNA SYNTHESIS AFTER IRRADIATION. V. Drášil, J. Soška, and Z. Karpfel (Czechoslovak Academy of Sciences, Brno). Folia Biol. (Prague) 5, 89-95(1959).

Data are presented which indicate that DNA synthesis in the spleen of irradiated mice not only reacts sensitively to the administration of normal hematopoietic tissue after irradiation, but that this reaction can also be a quantitative index of the effectiveness of bone marrow after irradiation. It was found that non-differentiated cells from hematopoietic tissue, which are capable of mitotic division, are probably responsible for a favorable effect. (auth)

15007

CHANGES IN ADAPTIVE OXYGEN CONSUMPTION IN MICE SUBJECTED TO THE ACTION OF CYSTEINE AND IRRADIATION. L. Novák and A. Vacek (Czechoslovak Academy of Sciences, Brno). Folia Biol. (Prague) 5, 134-9(1959).

In experiments in male white mice of strain H it was demonstrated that a single total-body dose of 500 r was followed, within one hour of irradiation, by a decrease in adaptive oxygen consumption as compared with the controls. The decrease in adaptive oxygen consumption in animals irradiated after intraperitoneal injection of cysteine was intensified as compared with animals which received an intraperitoneal injection of cysteine only. (auth)

15008

RELEASE OF GENETIC VARIABILITY THROUGH RECOMBINATION. II. DROSOPHILA PERSIMILIS.

Eliot B. Spiess (Univ. of Pittsburgh). *Genetics 44*, 43-58(1959) Jan.

Two samples of ten second chromosomes each of *Drosophila persimilis* were chosen for their near normal viability in homozygous condition from populations occupying localities in Yosemite National Park, California. A total of 1900 recombinant chromosomes from these original 20 were tested for viability effects in homozygous condition. Recombinant viabilities are lower on the average than control viabilities, that is they regress toward the average viability of homozygotes in the populations from which they come. The range of viability observed among recombinants extended from lethality to supervitality, but neither the number nor distribution of lethals is greater than or unaccountable by point mutation. This fact is in marked contrast with *D. pseudoobscura* which certainly produced some lethals synthetically, that is by recombination. Analysis of variance shows a significant increase in the genetic components of variability especially in interaction effects on viability and variance differences over their controls. None the less, the magnitude of this array of variance is not as great as in the sibling species, *pseudoobscura*. While it is known that both species are highly heterozygous, it is possible that the difference between them in these recombinant effects may be due to less epistatic interaction of nonallelic loci in *persimilis* than in *pseudoobscura*. On the other hand a real difference in amount of heterozygosity between these species may account for their differences in recombination effects. (auth)

15009

THE RELATION OF OXYGEN POSTTREATMENT AND HETEROCHROMATIN TO X-RAY-INDUCED CHROMOSOME ABERRATION FREQUENCIES IN *CREPIS CAPILLARIS*. Marjorie W. Sire and R. A. Nilan (State Coll. of Washington, Pullman). *Genetics 44*, 124-36 (1959) Jan.

Resting seeds of *Crepis capillaris* were x irradiated at 1500 or 3500r and then stored under 100 lbs oxygen pressure for periods up to 42 days. The frequencies of abnormal cells, dicentric chromosomes, and acentric rod and isodiametric fragments increased during the post—irradiation oxygen treatment. Non-irradiated seeds exhibited an appreciable frequency of chromosome aberrations after 42 days of the oxygen treatment. Oxygen had no influence on the proportion of breaks in each chromosome because it uniformly increased the aberrations in all six chromosome arms. However, oxygen did appear to inhibit the restitution and rejoining processes since the ratio of breaks that did rejoin to those that did not rejoin decreased during the post-irradiation treatment. In both x-irradiated and stored x-irradiated seeds, certain arms exhibited frequencies of breaks leading to dicentric chromosomes and simple breaks (those that do not rejoin or restitute) that significantly differed from the frequencies expected on the basis of length of arms. The cause of this apparent non randomness was found in the relation of euchromatin and heterochromatin to chromosome breaks. Breaks leading to dicentrics occurred in or near the heterochromatic areas whereas the simple breaks occurred in the euchromatic areas of the chromosome arms. When the observed frequencies of breaks were compared with the lengths of heterochromatin and euchromatin in each arm, they equalled the expected frequencies. It is concluded that x-ray induced breakage probably occurs at random in *Crepis capillaris* chromosomes, and the apparent non randomness of these breaks is due to the differential influence of euchromatin and heterochromatin on the rejoining process. The frequency of intrahomologous exchanges observed equalled the expected frequency. However, higher than expected frequencies of chromatid breaks were found; most of these breaks occurred in the long arm of D. (auth)

15010

RADIATION DOSAGE TO FEMALE GONADS DURING DIAGNOSTIC ROENTGENOGRAPHIC PROCEDURES. George Cooper, Jr. and Kenneth Williams (Univ. of Virginia, Charlottesville). *J. Am. Med. Assoc. 170*, 766-9(1959) June 13.

The current state of knowledge about radiation hazards and ways to minimize dosage during medical diagnostic roentgenography makes it possible to focus our concern on those procedures which involve passing the x ray beam through or near the ovaries of women not past the child-bearing age. Statistics from the University of Virginia Hospital at Charlottesville showed the number of roentgenographic examinations done in 1957 which involved delivery of relatively large radiation dosage to the ovaries, the age distribution of the patients undergoing these procedures, and an estimate of the average radiation dosage, exclusive of fluoroscopy, delivered to the ovaries of adults by the techniques then in use. Assuming that only essential examinations will be performed during pregnancy, the greatest opportunity for ovarian dosage reduction in this particular institution lies in strict evaluation of the need for roentgenographic investigation of the gastrointestinal tract, gallbladder, and lumbar area of spine in young women and of repeated roentgenographic examinations in the handling of hip disease in young girls. (auth)

15011

THE ROLE OF THE UNITED STATES ARMY MEDICAL NUTRITION LABORATORY'S PATHOLOGY BRANCH IN THE STUDY OF IRRADIATED FOODS. S. W. Thompson (Fitzsimons Army Hospital, Denver). *J. Am. Vet. Med. Assoc. 134*, 387-91(1959)

Extensive pathological studies are being conducted on a variety of tissues from 4 generations of rats which had been maintained for 2 years on a composite control of irradiated diet. The histopathological studies of the first and second generation rats completed to date have not revealed any significant differences in disease incidence between the 2 diet groups. 14 references. (auth)

15012

A METHOD FOR QUANTITATIVE ESTIMATION OF RAT ERYTHROCYTES IN THE MOUSE-RAT CHIMERA. W. St. Amand and L. H. Smith (Oak Ridge National Lab., Tenn.). *J. Appl. Physiol. 14*, 445-7(1959) May.

A method is described for determining the proportion of mouse and rat erythrocytes in chimeras based on a qualitative species-specific hemolysin difference. Estimates of the proportion of mouse and rat cells are made on the basis of two spectrophotometric measurements, an initial reading of a suspension of erythrocytes and a final reading on the supernatant fluid after the sample is certrifuged. Composition of the blood mixture may be read directly from a chart or calculated from a mathematical expression. (C.H.)

15013

HETEROGENEITY IN THE TURNOVER RATES OF LIVER CHOLESTEROL ESTERS. Peter D. Klein and Rita A. Martin (Argonne National Lab., Lemont, Ill.). J. Biol. Chem. 234, 1685-7(1959) July.

Sodium acetate labeled with carbon-14 and a recently developed method of cholesterol ester fractionation were used to investigate the rates at which newly synthesized cholesterol is incorporated into various cholesterol esters in rat liver. Results indicate that the incorporation rates are heterogeneous, differing according to the constituent fatty acids, and that these rates do not represent a simple esterification process in equilibrium with a pool of fatty acids. The pertinence of these findings to the regulation of cholesterol metabolism by the rat is considered. (C.H.)

15014

EFFECT OF FETAL X-IRRADIATION UPON THE SUBSEQUENT FERTILITY OF THE OFFSPRING. Roberts Rugh and Sylvia Jackson (Columbia Univ., New York). J. Exptl. Zool. 138, 209-21(1958) July.

Fetal female mice ranging from days 15.5 to 18.5 can tolerate more x irradiation than can adult females without incurring appreciable effects on fertility. On fetal day 16.5, comparable in embryonic development of the human gonads to about 85 days, the fetal ovary is the most radiosensitive. While it requires an exposure of about 200 r to show any appreciable reduction in fertility, 50 r does have some effect. After 16.5 days the fetal ovary appears to be quite radioresistant. Fetal male mice exhibit a drastic reduction in subsequent fertility when exposed to 200 r x rays on days 15.5 or 16.5, corresponding to days 65 to 85 for the human. This is in direct contrast to the adult testis which is comparatively very radioresistant. There is no evidence in either the male or the female of temporary sterility or in delayed maturation resulting from fetal x irradiation between days 15.5 and 18.5. Whatever effect on the gonads is inflicted remains steady throughout the 9 months period of observation. Litter size average showed a slight reduction from males x-rayed in utero at 15.5 to 17.5 days by 200 r x rays, while the females showed slight reduction when x-rayed only at 16.5 and 17.5 days. There was in no instance any suggestion of stimulation of germinal epithelium by x irradiation, resulting in greater fertility than the controls. The final litter from any mating of irradiated mice was within the normal range, i.e., there was no tapering off of fertility in terms of litter size. The reaction of the fetal gonad to x irradiation bears no relation to the radiosensitivity of the adult gonad. The fetal testis is more radiosensitive than is the adult testis, and the fetal ovary is more radioresistant than is the adult ovary, as measured by subsequent fertility. (auth)

15015

THE EFFECTS OF X OR NEUTRON IRRADIATION, INDIA INK BLOCKADE, OR SPLENECTOMY ON INNATE IMMUNITY AGAINST TRYPANOSOMA DUTTONI IN MICE. Bernard N. Jaroslow (Argonne National Lab., Lemont, Ill. and Univ. of Chicago). J. Infectious Diseases 104, 119-29(1959) Mar.-Apr.

Infection of Trypanosoma duttoni in mice and of T. lewisi in rats was studied in animals injured to varying degrees by different procedures. The effect of injury on the level of innate immunity of the host was measured by changes in either or both the percentage of young and dividing forms in the parasite population and parasitemia. The trypanosome infection in groups of mice exposed to large acute doses of x rays (550 r, 650 r, and 750 r) of fission neutrons (350 rads and 330 rads) one day before infection was characterized by a progressively increasing percentage of division forms and a very high parasitemia. In spleen-shielded animals exposed to 550 r, the percentage of division forms was similar to that of irradiated controls until immunity was developed. Neither splenectomy nor spleen irradiation resulted in an increase in either reproductive activity or parasitemia. India ink blockade resulted in an elevated number of division forms early in the infection but had no effect on parasitemia. When blockade was combined with x ray, the action was additive. In irradiated (600 r) rats the initial level of reproductive activity of T. lewisi was not affected but the resultant parasitemia was abnormally high. It is concluded that innate immunity to reproductive activity was decreased by injury to the lymphoid-macrophage system, whereas trypanocidal activity was decreased only when the host was more extensively injured. (auth)

15016

PECULIARITIES IN THE COURSE OF INFECTIVE PROCESSES ASSOCIATED WITH THE ACTION OF IONIZING RADIATION ON THE BODY. P. N. Kiselev, V. N. Sivertseva, and E. V. Karpova (Central Radiological Inst., Ministry of Public, U.S.S.R.). J. Microbiol. Epidemiol. Immunobiol. (USSR) (English Translation 29, 1557-66(1958).

An investigation was made of the basic laws of the development of infections in an individual subjected to the action of large doses of ionizing radiation. The sharp increase in the susceptibility of irradiated animals to infection was found to be dependent on a considerable reduction or complete loss of natural immunity, and also on a great increase in the penetrability of the tissues and a reduction in their barrier properties, which open the door to infection. Reaction mechanisms involved are discussed. (C.H.)

15017

CHANGE IN IMMUNO-REACTIVE PROPERTIES OF RABBITS UPON EXPOSURE TO X-RAYS. I. I. Khvorostukhin and K. M. Akylbekov (Kirghiz Medical Inst., Frunze, S.S.R.). J. Microbiol. Epidemiol. Immunobiol. (USSR) (English Translation) 29, 1682 (1958).

Results are reported from a study of the influence of exposure to x rays on the immune state of rabbits injected with skin extract. Complement-fixation tests were carried out with titrated doses of antigen and various dilutions of rabbits' sera. Results are summarized. (C.H.)

15018

X-IRRADIATION EFFECTS ON THE HUMAN FETUS. Roberts Rugh (Columbia Univ., New York). J. Pediat. 52, 531-8(1958) May.

The embryo, particularly between days 18 and 38, and the later fetus, represent the most radiosensitive stages in the life of human beings, due largely to the presence of actively differentiating cells involved in organogenesis. During certain periods of development, monstrosities in the offspring may be produced by low level therapeutic or even diagnostic exposures of the pregnant woman. Teratologies are less likely as the embryo becomes a fetus and are never formed by irradiation of the fully developed adult. Nevertheless, the damaging effects of ionizing radiations become more subtle with advancing fetal age and may well produce viable but psychologically illadjusted individuals. It is concluded that the x irradiation of the pregnant woman, particularly in the early trimester, should be discouraged under all conditions, short of saving the life of the mother. Further, it would be a wise practice to determine the time of the prior menses in all radiological examinations of women in order to avoid the possibility of exposure of an unrecognized pregnancy during the most radiosensitive period at about 2.5 to 6 weeks. (auth)

15019

TRANQUILIZERS AND X-IRRADIATION LETHALITY. John F. Wohnus and Roberts Rugh (Columbia Univ., New York). Military Med. 123, 228-36(1958) Sept.

Tranquilizers (reserpine, meprobamate, chlorpromazine, benactyzine, phenobarbital) and acetylsalicylic acid were injected intraperitoneally in CF-1 mice prior to whole–body 600 r x irradiation and the effect on mortality and weight determined. None of the above tranquilizers afforded any statistically valid protection of the mice on a 30 day test basis. Saline solution when administered in sufficient volume and at a time that permits an effective volume to be retained during x irradiation procedures is beneficial in reducing the x irradiation effects, both in regard to mortality and to weight loss. There was a characteristic pattern to the change in weight following 600 r whole–body x irradiation: an immediate and progressive loss in weight occurred during days 0 to 15 post-irradiation and was followed by a gradual gain. The pre-irradiation weight was regained between days 20 to 25 after x irradiation but a secondary minor loss occurred about day 40. This was followed by progressive gain to approach the normal control weights by day 55 post x irradiation. (auth)

15020

EFFECT OF PYRIMIDINE DEOXYRIBONUCLEOTIDES ON THE REGENERATION OF BONE-MARROW IN IRRADIATED MICE. Z. Karpfel, J. Soška, and V. Drášil (Czechoslovak Academy of Sciences, Brno). Nature 183, 1600-1(1959) June 6.

The injection of desoxycytidylic acid and thymidic acid after irradiation stimulated the regeneration of bone marrow in irradiated mice. Reaction mechanisms involved are discussed. (C.H.)

15021

THE EFFECT OF CYSTAMINE ON ACUTE RADIOTOXICITY OF P^{32} IN MICE. D. J. Mewissen (Univ. of Liége) and C. L. Comar (Cornell Univ., Ithaca, N. Y.). Nuclear-Med. 1, 47-53(1959).

A total of 240 DBA I mice were given one intraperitoneal injection of P^{32}. The experimental group was given a 0.2 percent aqueous solution of cystamine for a 60-day period as drinking water; controls received only ordinary water. The protective effect of cystamine per os against the radiotoxicity of P^{32} was statistically significant. The L.D. 50/30 days was estimated 4.5 μc/gm for the control group and 6.1 μc/gm for the cystamine group. The biological half-life of P^{32} in DBA I mice was estimated to be 8.1 days. A 9-percent retention out of the initial dose, corrected for physical decay, was found in DBA I mice after a 3-month period. (auth)

15022

THE EFFECT OF FRUCTOSE ON ATP METABOLISM IN RADIATION DAMAGED LIVER. J. Pany (Universität, Vienna). Nuclear-Med. 1, 71-9(1959). (In German)

The effects of intraperitoneally administered solutions of fructose, glucose, and saline on radiation-induced alterations of adenosine triphosphate metabolism in the liver of rats have been investigated using radioactive phosphate. Based on measurements of P^{32} incorporation into ATP a favorable action of fructose, as compared to glucose, on ATP metabolism has been observed. The radiation-induced increase in adenosine triphosphatase activity has been found to be reduced following administration of fructose. The mode of hexose utilization in radiation damage of the liver and the mechanisms of this damage are discussed. (auth)

15023

RADIOISOTOPES IN BIOLOGY AND MEDICINE. Janusz Wasyluk. Nukleonika 4, 47-64(1959). (In Polish)

The effectiveness of certain isotopes used in biology and medicine is discussed. Various methods of radioisotope induction into organisms and the body responses to radioisotopes (initial retention, critical organs, biological half-time, etc.) are analyzed. (R.V.J.)

15024

MUTATION INDUCTION AND MACROMOLECULAR SYNTHESIS IN BACTERIA. C. O. Doudney and F. L. Haas (Univ. of Texas, Houston). Proc. Natl. Acad. Sci. U. S. 45, 709-22(1959) May.

Results are reported from an investigation of post-irradiation processes which influence the final ultraviolet-induced mutation response of *E. coli*. The role of protein synthesis was studied in detail. (C.H.)

15025

IMMUNIZATION AGAINST EHRLICH'S ASCITES CARCINOMA WITH X-IRRADIATED TUMOR CELLS. David M. Donaldson and John R. Mitchell (Brigham Young Univ., Provo, Utah and Utah Valley Hospital, Provo). Proc. Soc. Exptl. Biol. Med. 101, 204-7(1959) June.

Pre-immunization with irradiated Ehrlich's ascites tumor cells protected mice against subsequent transplants of viable cells. Immunization procedures started one day after challenge with the tumor significantly reduced mortality. Such post-immunization did not inhibit the rapid multiplication that follows transplantation of the tumor. The evidence indicated that the immunization procedures employed resulted in a lethal rather than a static effect on transplanted tumor cells. (auth)

15026

PROTECTIVE ACTION OF CYSTEINAMINE (β-MERCAPTOETHYLAMINE) AGAINST X-IRRADIATION-INDUCED STERILITY IN CF_1 MALE MICE. S. C. Wang, Sondra Kuskin, and Roberts Rugh (Columbia Univ., New York). Proc. Soc. Exptl. Biol. Med. 101, 218-21(1959) June.

Cysteinamine, when administered prior to x irradiation, has been shown to be very effective in increasing percentage of survival of CF_1 mice given otherwise lethal doses of x rays. It is also capable of preventing transient sterility in male mice during first 2 or 3 months following x irradiation given to whole body or to testes alone. (auth)

15027

EFFECTS OF EXTREMELY HIGH X-RAY INTENSITIES AND DOSAGES ON MICE. W. S. Moos, H. C. Mason, M. Counelis, and R. A. Harvey (Univ. of Illinois, Chicago and Illinois State Psychopathic Inst., Chicago). Proc. Soc. Exptl. Biol. Med. 101, 309-14(1959) June.

The effects of extremely high x ray dose rates and dosages on mice irradiated at normal and subnormal body temperatures were studied. Considerable lengthening of survival time is obtained when body temperature is lowered during irradiation. A slight elevation of body temperature during irradiation was noticed. (auth)

15028

CARBOHYDRATES AND GASTROINTESTINAL ABSORPTION OF RADIOSTRONTIUM AND RADIOCALCIUM IN THE RAT. R. H. Wasserman and C. L. Comar (Cornell Univ., Ithaca, N. Y.). Proc. Soc. Exptl. Biol. Med. 101, 314-17(1959) June.

The influence of 14 carbohydrates on gastrointestinal absorption of radiostrontium and radiocalcium was studied in the rat. Cellobiose, sorbose, ribose, xylose, lactose, raffinose, melibiose, glucosamine, mannitol, and sorbitol significantly enhanced alkaline earth absorption whereas glucose, galactose, fructose, and sucrose had little or no effect. In a balance-type study with Sr^{85}, enhanced retention due to dietary lactose as compared with dietary sucrose could be accounted for by increased intestinal absorption rather than by direct effect on skeletal ossification. Effectiveness in ability to enhance calcium and strontium absorption appeared to be positively correlated with a prolonged residence time of the carbohydrate in the gut or absorption of carbohydrate by a passive mechanism. (auth)

15029

FACTORS AFFECTING METABOLISM OF MUSCLE COLLAGEN. II. EFFECT OF RADIATION EXPOSURE. K. Konno, K. I. Altman, and L. H. Hempelmann (Univ. of Rochester, N. Y.). Proc. Soc. Exptl. Biol. Med. 101, 320-1(1959) June.

C^{14} activity of muscle collagen was measured in x-irradiated and sham-irradiated rats given glycine-2-C^{14} and glucose-U-C^{14} prior to exposure. Whole-body x irradiation resulted in reduction of isotope concentration of collagen in animals given glycine-2-C^{14} but caused an increase in isotope concentration when glucose-U-C^{14} had been administered. It is concluded that x irradiation and aging have similar over-all effects on collagen metabolism when studied with above-mentioned C^{14}-labeled precursors. (auth)

15030

EFFECT OF MOLYBDENUM ON FLUORIDE RETENTION IN THE RAT. George K. Stookey and Joseph C. Muhler (Indiana Univ., Bloomington). Proc. Soc. Exptl. Biol. Med. 101, 379-80(1959) June.

The presence of 50 ppm Mo as ammonium molybdenate is associated with significantly more fluoride retention in skeletal and carcass of the rat, than when Mo is absent from drinking water. These data suggest that Mo may act metabolically to increase availability of fluoride ion. (auth)

15031

CELLULAR RESPONSES. William Bloom (Univ. of Chicago). Revs. Modern Phys. 31, 21-9(1959) Jan.

Irradiation of dividing newt cells in culture with 200-kv x rays or with ultraviolet light produces few or many abnormalities depending on the amount of radiation applied. Localized irradiation of chromosomes with a few tens of protons makes them sticky. But no abnormalities in the mitotic process result when a small area of cytoplasm is irradiated with 28,300 protons. Localized irradiation of cytoplasm with ultraviolet light prevents formation of the spindle or destroys it if it has already formed. In such cells, groups of whole chromosomes (not chromatids) move apart, usually in inequal numbers, to form the daughter nuclei of the dividing cell. The spindle thus seems to provide a mechanism for guiding the chromatids in anaphase, since, in the absence of a spindle, groups of whole chromosomes can move apart and form the nuclei for the daughter cells. Localized ultraviolet irradiation of chromosomes changes the index of refraction at the affected area. Such pale spots stain very faintly for DNA with the Feulgen method and absorb very little at 260 $m\mu$. (auth)

15032

IONIZING ENERGY AS AN AID IN EXCHANGE TRITIUM LABELING. Richard M. Lemmon, Bert M. Tolbert, Walter Strohmeier, and Irville M. Whittemore (Univ. of California, Berkeley). Science 129, 1740-1(1959) June 26.

The tritium labeling of organic compounds by the Wilzbach technique—that is, by simple exposure of the compound to tritium gas—is greatly accelerated by the simultaneous exposure of the system to a silent electrical discharge. The incorporation of tritium into benzene was increased by a factor of about 10^4 without undue composition. Cobalt-60 γ rays were found to be far less useful for increasing the tritium incorporation. (auth)

15033

EXPERIMENTAL PRODUCTION OF LIVER CIRRHOSIS BY PROLONGED ADMINISTRATION OF BERYLLIUM SULFATE. Chuhei Nakase (Tokushima Univ., Japan). Tokushima J. Exptl. Med. 5, 171-99(1958) Dec.

The pathological effects of injected beryllium sulfate were studied in the liver of rabbits. Data are presented from histologic examination and histochemical observations. The relation of beryllium to liver cirrhosis is discussed. (C.H.)

CHEMISTRY

General

15034 AECU-4175

Pennsylvania State Univ., University Park and
Michigan. Univ., Ann Arbor.

POLAROGRAPHIC BEHAVIOR OF ALKYL PHENYL KETONES WITH NUCLEAR AND SIDE-CHAIN SUBSTITUTED HALOGEN. Report No. 46. Philip J. Elving and Joseph T. Leone. Feb. 1, 1959. 30p. Project 8. Contracts AT(30-1)-822 and AT(11-1)-70. $4.80(ph), $2.70(mf) OTS.

Several alkyl phenyl ketones with chlorine and bromine substituted on the benzene ring and/or on the alkyl group were examined polarographically to determine the effect of structure on the carbonyl group and carbon-halogen bond reductions, and to obtain more information on the mechanism for the latter process. Nuclear halogen substitution facilitates carbonyl group reduction, although not in the manner expected from a consideration of $+I_s$ effects, and it has no apparent effect on the fission of side chain halogen. Addition of halogen on the side chain has no effect on carbonyl group reductions since the carbon-halogen bond is ruptured at a more positive potential. In the region below pH 3.5, fission of the C—Cl bond is facilitated by increasing hydrogen ion concentration. This dependence is probably due to the role of hydrogen in a push-pull mechanism at the electrode, which is accented in the present study by the decreased dissociation of hydrogen chloride in the 9.5% ethanol solutions used. (auth)

15035 AECU-4176
Michigan. Univ., Ann Arbor.
CHEMISTRY OF SOLUTIONS IN LIQUID SULFUR DIOXIDE. Report No. 47. Philip J. Elving and Joseph M. Markowitz. Apr. 7, 1959. 29p. Contract AT(11-1)-70, Project 8. $4.80(ph), $2.70(mf) OTS.

Unsolved problems of interpretation and mechanism in the polarographic behavior of organic compounds relate logically to three areas: the effect of the chemical nature of the electroactive substance on the magnitudes of the current and half-wave potential; the effect of the solution environment on the foregoing magnitudes; and the basic theory of the polarographic process itself. The first result of an intensive investigation of the second area is an introductory review of the reported chemistry of solutions of inorganic and organic species in liquid sulfur dioxide, and covers the following topics: general properties of liquid sulfur dioxide; solvent properties of the latter, including solubility phenomena, solvate formation and electrical conductivity; reactions in sulfur dioxide solution; proposed theories of chemical reactivity in sulfur dioxide as solvent and the objections to them; electrochemical processes in sulfur dioxide solution (electrolyses and electrode potential measurements). (auth)

15036 AERE-I/R-2815
United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.
THE RADIATION INDUCED SYNTHESIS OF THE GAMMA-ISOMER OF 1:2:3:4:5:6-HEXACHLOROCYCLOHEXANE ("GAMMEXANE"). PART I. SYNTHESIS BY ULTRAVIOLET RADIATION. P. R. Hills, R. Roberts, and M. W. Spindler. Jan. 1959. 30p.

As a contribution to the study of the preparation of the gamma-isomer of 1:2:3:4:5:6-hexachlorocyclohexane by high-energy radiation, the optimum conditions for the photo-activated addition of chlorine to benzene were established. The results that have been obtained will provide a comparison for further studies. Quantum yields were determined under a variety of conditions. In the absence of additives and without any pretreatment, a value of 1.58×10^3 was recorded, which was increased to 8.67×10^3 by modifying the experimental conditions. The addition of activators was not effective in increasing the gross yield of gamma-isomer, but a comparison with published data shows that high chlorination yields were achieved. A modified method for the polarographic determination of the gamma-isomer was investigated. (auth)

15037 AFOSR-TN-58-773
Rensselaer Polytechnic Inst., Troy, N. Y.
BIBLIOGRAPHY ON MOLTEN SALTS. Technical Note No. 9. Charles T. Brown, Henry J. Gardner, Gerome Goodkin, George J. Janz, Max R. Lorenz, James D. McIntyre, and Cyril Solomons, comps. Sept. 1958. 81p. Project No. 9972-7772. ARDC Contract No. AF49(638)-50. (AD-201776).

Approximately 1000 references covering contributions in the technical press from the earliest date to 1958 are presented. Each reference is listed by author, journal, and title of the article. The subject classification, arbitrarily selected, reflects the particular interests of physical chemistry as it pervades the more specialized fields of electrochemistry, extractive metallurgy, ceramics, and various aspects of high temperature technology. (W.D.M.)

15038 CF-59-5-127
Oak Ridge National Lab., Tenn.
URANYL SULFATE-DOWEX 21K ANION EXCHANGE: A LITERATURE SURVEY, REVIEW OF PRELIMINARY DATA AND OUTLINE OF A PROPOSED EXPERIMENTAL PROGRAM. S. H. Jury and J. B. Adams. May 14, 1959. 43p. $7.80(ph), $3.30(mf) OTS.

The system Dowex 21K and aqueous uranyl sulfate solutions were studied in the solution composition range: 0–0.005 $\underline{M}$/l uranyl sulfate, 0.15 $\underline{M}$/l total sulfate, and 0.02 $\underline{M}$/l H_2SO_4 (pH 2). It is shown that UO_2SO_4 and/or $UO_2(SO_4)_2^{2-}$ are sorbed on the resin to form $R_2UO_2(SO_4)_2$. It is surmised that these same species are also involved at higher uranyl concentrations and pH ≤ 2. Above pH 2 it is suggested that $U_2O_5SO_4$, $U_2O_5(SO_4)_2^{2-}$, and $R_2U_2O_5SO_4$ species may be involved. An IBM 704 calculation and mathematical treatment of the ion equilibria in solution are presented to predict that in solutions of fixed acid and total uranyl sulfate concentration the UO_2SO_4 specie concentration exhibits a maximum as the total sulfate concentration is varied. Based on these observations a method is outlined for determining the solution uranyl ion specie equilibrium constants from equilibrium resin sorption experiments. (auth)

15039 CRDC-842
Atomic Energy of Canada Ltd., Chalk River, Ont.
THE DETERMINATION OF IMPURITIES IN URANIUM BY X-RAY FLUORESCENCE SPECTROMETRY. R. W. Jones. Feb. 1959. 12p. (AECL-822). $0.20(AECL).

A simple, rapid x-ray fluorescence spectrographic method was developed for the determination of several impurities in uranium. The method is comparable in sensitivity and accuracy to existing spectrophotometric procedures for chromium, iron, nickel and zirconium, the impurity elements examined, but is superior because of its speed. The procedure should be applicable to the determination of numerous other impurity elements in uranium. (auth)

15040 ERDL-1525-TR
Army Engineer Research and Development Labs., Fort Belvoir, Va.
LUBRICATING OILS AND GREASES IN THE SOVIET UNION. Literature Research Study. Nikita Cheremeteff. May 22, 1958. 109p. Project No. 8-93-31-108. (AD-201738).

A comprehensive study is presented of Soviet literature on lubricating oils. The report is divided into three chapters: I. Lubricants; II. Silicons and Oil Additives; and III. Greases. The text is supplemented by tables which give the characteristics of the different types of lubricating stuffs. Emphasis is placed on oil additives used to counteract wear, oxidation, mechanical deposits, unstability, poor viscosity, and results of temperature variations. The different kinds of additives are defined, and their characteristics and functions are given. (auth)

15041 HW-59864
General Electric Co. Hanford Atomic Products Operation, Richland, Wash.
INTERNAL STANDARD METHOD OF GENERAL SPECTROGRAPHIC ANALYSIS. F. M. Smith. Apr. 9, 1959. 15p. Contract W-31-109-Eng-52. $0.50(OTS).

A general spectrographic method of moderate accuracy was developed for analysis of diverse materials. The method was studied by the preparation of working curves for the elements Cr, Fe, Ni, Co, Al, Mo, Cu, B, Mg, Mn, Sn, Si, U, Bi, Be, Pb, Ti, Ag, Zn, and Zr. These can be determined with an average deviation of

±15% and with an accuracy of within 20%. The powdered sample is mixed with a diluent containing germanium dioxide, graphite and an internal standard, gallium oxide. A portion of this mix is packed into a graphite electrode cup and arced at 15 amperes d-c for 120 seconds. (auth)

15042 IGO-AM/S-136
United Kingdom Atomic Energy Authority. Industrial Group. Springfields Works, Springfields, Lancs, England.
THE ABSORPTIOMETRIC DETERMINATION OF CHROMIUM IN URANIUM–VANADIUM ALLOYS. Mar. 3, 1959. 5p.

The U–V is dissolved in HNO_3 and the Cr oxidized to the hexavalent state by $KMnO_4$. Excess $KMnO_4$ is removed by EDTA. The Cr is determined spectrophotometrically using diphenylcarbazide after the V color fades. The method is suitable for Cr contents up to 0.2%. (T.R.H.)

15043 IGO-AM/S-138
United Kingdom Atomic Energy Authority. Industrial Group. Springfields Works, Springfields, Lancs, England.
THE VOLUMETRIC DETERMINATION OF TIN IN URANIUM–TIN ALLOYS. Mar. 3, 1959. 5p.

Tin is determined in Sn–U alloys by dissolution in $HCl-H_2O_2$, reduction with Al metal and $TiCl_3$, and iodometric determination. (T.R.H.)

15044 IGO-AM/S-139
United Kingdom Atomic Energy Authority. Industrial Group. Springfields Works, Springfields, Lancs, England.
VOLUMETRIC DETERMINATION OF CHROMIUM IN URANIUM–CHROMIUM MASTER ALLOY. Mar. 3, 1959. 4p.

The U–Cr is dissolved in H_3PO_4 and the U is oxidized before the solution is diluted. H_2SO_4 is added and the Cr is oxidized by boiling with $(NH_4)_2S_2O_8$. The Cr is determined by titrating the excess of added ferrous salt with standard $K_2Cr_2O_7$. The method is applicable to alloys containing about 5% Cr. (T.R.H.)

15045 IGO-AM/S-142
United Kingdom Atomic Energy Authority. Industrial Group. Springfields Works, Springfields, Lancs, England.
THE GRAVIMETRIC DETERMINATION OF NIOBIUM IN URANIUM–NIOBIUM ALLOYS. Mar. 3, 1959. 4p.

The bulk of the Nb is precipitated from a sulfate solution of the alloy by hydrolysis. The remainder is precipitated by tannic acid and cinchonine. The precipitate is then ignited and weighed as Nb_2O_5. The method is suitable for alloys containing 0.2 to 0.4% Nb. Tungsten interferes. (T.R.H.)

15046 IGO-AM/S-145
United Kingdom Atomic Energy Authority. Industrial Group. Springfields Works, Springfields, Lancs, England.
THE ABSORPTIOMETRIC DETERMINATION OF URANYL FLUORIDE IN URANIUM TETRAFLUORIDE. Feb. 23, 1959. 4p.

The UO_2F_2 can be extracted from UF_4 into saturated NaF solution and the U is determined spectrophotometrically. The method is suitable for samples containing up to 5% UO_2F_2. (T.R.H.)

15047 IGO-AM/S-146
United Kingdom Atomic Energy Authority. Industrial Group. Springfields Works, Springfields, Lancs, England.
THE ABSORPTIOMETRIC DETERMINATION OF URANIUM DIOXIDE IN URANIUM TETRAFLUORIDE. Feb. 27, 1959. 6p.

From 0 to 4% UO_2 may be determined in UF_4 by a method based on the insolubility of UF_4 in a solution of di-sodium EDTA. The UO_2 remains undissolved if boric acid is added to complex the fluoride ion. The UO_2 thus separated is determined by spectrophotometry of the U. A precision (3 × standard deviation) of ±10% may be expected. (T.R.H.)

15048 IGO-AM/S-166
United Kingdom Atomic Energy Authority. Industrial Group. Springfields Works, Springfields, Lancs, England.
THE VOLUMETRIC DETERMINATION OF URANIUM IN ZIRCALLOY–URANIUM ALLOYS. Mar. 3, 1959. 8p.

The U–Zircaloy alloy is dissolved in $HF-HNO_3$ and the fluoride is complexed with Al. The U is extracted into TBP in kerosene. After back-extraction and reduction to U^{4+}, the U is titrated with standard $K_2Cr_2O_7$. The method is suitable for alloys with U contents of 2 to 6%, and it has a precision of ± 0.5% at the 95% confidence level. (T.R.H.)

15049 IGO-AM/S-197
United Kingdom Atomic Energy Authority. Industrial Group. Springfields Works, Springfields, Lancs, England.
THE GRAVIMETRIC DETERMINATION OF PHOSPHORUS IN THORITE (AMMONIUM PHOSPHOMOLYBDATE). Feb. 27, 1959. 5p. $0.17(BIS).

The sample is fused with sodium hydroxide, leached with water, and filtered. The residue is ignited and again fused with sodium hydroxide, leached, and filtered. The two filtrates are combined and the phosphorus is precipitated by the addition of ammonium nitromolybdate. The precipitate is filtered off, dissolved in ammonia solution and reprecipitated. This precipitate is filtered on a tared, sintered glass crucible, dried, and weighed. (auth)

15050 IGR-141(O/W)
United Kingdom Atomic Energy Authority. Industrial Group. Windscale Works, Sellafield, Cumb., England.
ANALYTICAL METHOD FOR THE GRAVIMETRIC DETERMINATION OF URANIUM IN PURE URANYL NITRATE SOLUTIONS. May 1, 1959. 4p.

A weighed volume of the sample solution is diluted, and the uranium is precipitated with ammonium hydroxide. The precipitate is filtered off and dried at 100°C. The dried precipitate is ignited to block uranium oxide at 900°C, and the uranium is weighed as U_3O_8. (auth)

15051 ISC-1068
Ames Lab., Ames, Iowa.
PREPARATION OF LOW OXYGEN CONTENT YTTRIUM FLUORIDE. M. Smutz, G. Burnet, J. Walker, R. Tischer, and E. Olson. Sept. 1958. 51p. Contract W-7405-eng-82. $1.50(OTS).

The optimum conditions for the formation of very low oxygen content yttrium fluoride were determined. Various methods of preparing a very low oxygen content yttrium fluoride are presented. Since the chemical properties of yttrium are quite similar to those of the rare earths, yttrium was used in these studies with the object in mind that the processing conditions would probably be applicable to the rare earths. Yttrium fluoride was formed by hydrofluorinating various yttrium compounds with gaseous anhydrous hydrofluoric acid. The compounds used for these hydrofluorinations were yttrium oxide, hydrated yttrium fluoride, yttrium oxalate, yttrium chloride, yttrium nitrate, yttrium sulfate, and yttrium sulfide. The effects of time and temperature, oxalate ignition temperature, particle size, and hydrofluoric acid purity on the conversion of yttrium compounds to yttrium fluoride were also studied. The yttrium fluoride purification methods studied were molten fluoride hydrofluorination, vacuum distillation and inert gas sparging, all of which were carried out above the melting point of yttrium fluoride. (auth)

15052 JPL-PR-20-340
California Inst. of Tech., Pasadena. Jet Propulsion Lab.
A REVIEW OF SEAL MATERIALS FOR GUIDED-MISSILE APPLICATIONS. Progress Report. Robert J. Berg. Mar. 7, 1958. 18p. Contract DA-04-495-Ord 18.

The currently available seal materials which have proved useful in guided-missile applications are described. A series of proposed tests for evaluating new seal materials is included. These tests are designed to select materials which give promise of success in use, but they are not intended to be the sole tests used in the selection of seal materials. A summary is presented, in tabular form, of the results of experience with various seal materials. These materials are evaluated according to their chemical characteristics in so far as these characteristics determine compatibility. (auth)

15053 KAPL-M-LMO-3
Knolls Atomic Power Lab., Schenectady, N. Y.
DETERMINATION OF U/O_2 RATIO BY PRECISION LATTICE CONSTANT MEASUREMENTS. L. M. Osika. May 22, 1959. $1.80(ph), $1.80(mf) OTS.

The uranium to oxygen ratio can be determined by precision lattice parameter measurements and then applying the linear relationship of the uranium oxide composition versus lattice parameter change established by earlier workers. A brief description of the procedure and the method used to attain precision lattice parameters is presented. (auth)

15054 NAA-SR-Memo-622
North American Aviation, Inc., [Downey, Calif.].
LEAD—BISMUTH PUMP LOOP. R. Cygan. Mar. 13, 1953. 15p. $3.30(ph), $2.40(mf) OTS.

A summary of operating experience and observations obtained during approximately 500 hrs of running time on the PuP lead—bismuth forced circulation system is given. (auth)

15055 ORNL-2337
Oak Ridge National Lab., Tenn.
INTERIM REPORT ON CORROSION BY ALKALI-METAL FLUORIDES: WORK TO MAY 1, 1953. G. M. Adamson, R. S. Crouse, and W. D. Manly. June 5, 1959. 36p. Contract W-7405-eng-26. $1.25(OTS).

In connection with the search for container materials suitable for use in high-temperature molten-fluoride reactor systems, the corrosion of several metals by various fused fluoride mixtures was studied in thermal-convection loops made from the metal being tested. In these tests the temperature drop was fairly large, but the velocity of the liquid was low and not subject to control. The fluoride mixture used in most of the study contained 43.5 mole % KF, 10.9 mole % NaF, 44.5 mole % LiF, and 1.1 mole % UF_4, and is referred to as "fluoride 14." In a series of screening tests Inconel, or similar high-nickel alloys, was shown to be the most promising container material. The data reported are from loops that were operated for only relatively short times, 500 hr, and with impure fluoride mixtures. The lack of purity of the mixtures was an important consideration in the tests reported. With fluoride 14 an average figure for the maximum microscopically visible attack on Inconel was 0.012 to 0.015 in. after 500 hr of circulation. The attack was in the form of small voids which did not connect with the surface or with each other. It is shown that for the times used here the attack was caused primarily by the reduction of fuel impurities by chromium metal from the container and by the leaching of sufficient chromium to reach equilibrium concentrations in reactions with the fluorides, primarily with UF_4. In contrast to the effects of impurities, the depth and type of attack varied only slightly when changes were made in the major components of the various fluoride mixtures studied. The only effect definitely established was that, in every case, mixtures containing uranium fluoride caused more attack than did similar mixtures containing no uranium. When the loop was operated at a fluid temperature of 1650°F, the attack was slightly deeper than it was at 1300°F. The addition of zirconium hydride to the fuel almost completely eliminated the attack. Alkali metals also acted as inhibitors. It was found that type 316 stainless steel might be considered for a container for molten fluoride mixtures that do not include potassium fluoride. With such stainless steels and zirconium fluoride—base mixtures, the maximum depth of attack was about the same as that found with Inconel; however, more material was mass-transferred and cold-leg deposits were found. When alkali-metal-base mixtures were circulated in type 316 stainless steel, plugging occurred in a relatively short time; the plugging was probably caused by the formation of a compound similar to K_2NaCrF_6. (auth)

15056 TID-7568(Pt.3)
Oak Ridge National Lab., Tenn.
ANALYTICAL CHEMISTRY IN NUCLEAR REACTOR TECHNOLOGY. PART 3. PARTICLE-SIZE ANALYSIS. Second Conference, Gatlinburg, Tennessee, September 29—October 1, 1958. C. D. Susano, H. P. House, and Margaret A. Marler, eds. Apr. 1959. 104p. $1.00 (OTS).

Eight papers are included. Separate abstracts have been prepared for each paper. (W.L.H.)

15057 TID-7568(Pt.3)(p.3-10)
Wayne State Univ., Detroit.
THE DETERMINATION OF PARTICLE SIZES AND SIZE DISTRIBUTIONS BY MEANS OF LIGHT SCATTERING. Wilfried Heller. p.3-10 [of] ANALYTICAL CHEMISTRY IN NUCLEAR REACTOR TECHNOLOGY. PART 3. PARTICLE-SIZE ANALYSIS. Second Conference, Gatlinburg, Tennessee, September 29—October 1, 1958. 8p.

Various light-scattering quantities which may be used for the size determination of suspended colloidal spheres are derived from the Mie theory for the parameters a = 0.2(0.2)15.0 and m = 1.05(0.05)1.30. They include (1) the total turbidity as obtained by transmission measurements, (2) the light scattering and the polarization ratio at 90 deg, and (3) the spectra of the preceding quantities and the "wavelength exponents" characterizing the spectra. In addition, the angular scattering in the forward and backward directions and the dissymmetry are derived, but only for selected m-values. The data are compared with the results obtained from the approximating theories of Rayleigh-Gans and of Debye. Detailed experiments were carried out on the total turbidity, the angular scattering at 90 deg, the "scattering ratio" at 90 deg, and the wavelength exponents. The experimental work obtained on monodisperse systems fully verifies the theoretical data. The theoretical data and the experimental methods developed were applied to the determination of size-distribution curves in heterodisperse colloidal systems of spheres, with the turbidity used as a guide and the "scattering ratio" used as a quantitative argument. It is possible to reproduce size-distribution curves very satisfactory. (auth)

15058 TID-7568(Pt.3)(p.18-37)
Avco Mfg. Corp. Electronics Research Lab., Boston.
APPROXIMATION METHODS TO THE MIE SCATTERING THEORY FOR COLLOIDAL SPHERES. R. B. Penndorf. p.18-37 [of] ANALYTICAL CHEMISTRY IN NUCLEAR REACTOR TECHNOLOGY. PART 3. PARTICLE-SIZE ANALYSIS. Second Conference, Gatlinburg, Tennessee, September 29—October 1, 1958. 20p.

The computation of Mie scattering coefficients for spherical particles demands the use of high-speed electronic computers. Such computations are programmed for selected particle sizes and selected scattering angles. Practical applications, however, often require an interpolation of such tabulated values. An analytical method is outlined for the computation of the total scattering coefficient K for any size and any arbitrary refractive index. The phase and amplitude of the major maxima and minima can be determined by analytical expressions. The K values between these extrema are interpolated graphically. The precision of this method is about 3 per cent. For angular scattering coefficients, two graphical methods are outlined for interpolation of tabulated data. One method refers to the forward scattering area only. Very reliable data up to the second minimum can be obtained due to the systematic behavior of the scattering coefficients as a function of the diffraction parameter. Another method—based on the altitude chart idea proposed by van de Hulst—applies to all angles and all sizes. A precision of about 10 per cent or better can be obtained. (auth)

15059 TID-7568(Pt. 3)(p.38-42)
General Electric Co. Vallecitos Atomic Lab., San Jose, Calif.
GAMMA ABSORPTIOMETRIC METHODS IN THE SEDIMENTATION ANALYSIS OF LIQUID METAL—SOLID OXIDE SYSTEMS. Sydney C. Furman. p.38-42 [of] ANALYTICAL CHEMISTRY IN NUCLEAR REACTOR TECHNOLOGY. PART 3. PARTICLE-SIZE ANALYSIS. Second Conference, Gatlinburg, Tennessee, September 29—October 1, 1958. 5p.

A method was developed for determining the concentration and the rate of settling of particulate uranium compounds in NaK or sodium. The method depends on the difference between absorption of gamma radiation by the uranium compound and that by the sodium. The low energy gamma emitter, Se^{75}, was used to discriminate between uranium oxide and sodium at concentrations in the range of 5 to 30 weight per cent. (auth)

15060 TID-7568(Pt.3)(p.43-55)
Oak Ridge National Lab., Tenn.
AN EVALUATION OF THE PARTICLE-SIZE DISTRIBUTION IN MULTICOMPONENT SYSTEMS. L. C. Bate and G. W. Leddicotte. p.43-55 [of] ANALYTICAL CHEMISTRY IN NUCLEAR REACTOR TECHNOLOGY. PART 3. PARTICLE-SIZE ANALYSIS. Second Conference, Gatlinburg, Tennessee, September 29—October 1, 1958. 13p.

A neutron activation-sedimentation method is now being used to determine the particle-size distribution of mixtures of thorium and uranium oxides and of mixtures of oxides of iron, chromium, zirconium and uranium. In this paper the principles of the gamma spectrometric differentiation technique are described for each of the radioactive species induced by neutron activation as well as the sedimentation techniques that are used in the analysis. From the data which are presented, this method is shown to be unique and quite versatile for the determination of the size distribution of particulate matter in multicomponent systems. (auth)

15061 TID-7568(Pt. 3)(p.56-66)
Oak Ridge National Lab., Tenn.
PARTICLE-SIZE DISTRIBUTION OF THORIUM OXIDE BY A SEDIMENTATION METHOD. C. M. Boyd, H. P. House, and Oscar Menis. p.56-66 [of] ANALYTICAL CHEMISTRY IN NUCLEAR REACTOR TECHNOLOGY. PART 3. PARTICLE-SIZE ANALYSIS. Second Conference, Gatlinburg, Tennessee, September 29—October 1, 1958. 11p.

A cumulative sedimentation method is described for the determination of the particle-size distribution of thorium oxide. Within the range of 2 to 5 microns, gravitational sedimentation is applicable, while for particulate matter in the 0.05- to 2-micron range, centrifugal sedimentation is utilized to reduce the settling time and to circumvent the objectionable effects of convection currents and diffusion. By selection of suitable operating conditions, sedimentation can be accomplished in small cylindrical cells in 20 minutes or less. Oden's method of tangential intercepts is used to establish the particle-size distribution from cumulative sedimentation data. (auth)

15062 TID-7568(Pt. 3)(p.67-82)
Minnesota. Univ., Minneapolis.
PARTICLE-SIZE ANALYSIS OF SUBSIEVE PARTICULATES BY CENTRIFUGAL SEDIMENTATION. K. T. Whitby and A. B. Algren. p.67-82 [of] ANALYTICAL CHEMISTRY IN NUCLEAR REACTOR TECHNOLOGY. PART 3. PARTICLE-SIZE ANALYSIS. Second Conference, Gatlinburg, Tennessee, September 29—October 1, 1958. 16p.

Recent developments in the principles and applications of a general-purpose, centrifugal sedimentation method for rapid particle-size analysis are reviewed. Although the method represents a rather severe compromise of certain fundamental principles of sedimentation, experience has shown that it is a flexible and acceptably accurate method which is applicable to the size analysis of a wide range of powders, airborne dust samples, and dilute suspensions of fine particulates. The size distribution of particulate matter from 0.05 to above 100 microns can be measured by this method. In this paper, the results are presented of research sponsored by the U. S. Public Health Service and the American Society of Heating and Air Conditioning Engineers, in cooperation with the Mechanical Engineering Department, University of Minnesota, Minneapolis, Minnesota. (auth)

15063 TID-7568(Pt.3)(p.83-8)
Process Control Services Co., Elmhurst, Ill. and Oak Ridge National Lab., Tenn.
PARTICLE-SIZE DISTRIBUTION OF THORIUM OXIDE

BY ELECTRONIC SIZING. R. H. Berg, L. C. Bate, and G. W. Leddicotte. p.83-8 [of] ANALYTICAL CHEMISTRY IN NUCLEAR REACTOR TECHNOLOGY. PART 3. PARTICLE-SIZE ANALYSIS. Second Conference, Gatlinburg, Tennessee, September 29—October 1, 1958. 6p.

A new analysis method, utilizing a Coulter counter, is described for the determination of the particle-size distribution of thorium oxide. In this apparatus, a suspension of thorium oxide particles in a conductive liquid is caused to flow through an aperture. A pair of electrodes is individually suspended in the conductive liquid, one on either side of the aperture, and an electrical current is caused to flow between the electrodes. The method is based on the principle that, as a particle is carried through the aperture, the resistance between the two electrodes is changed, producing a voltage pulse of short duration, the magnitude of which is proportional to the size of the particle. These pulses are amplified, scaled, and counted to provide direct data for plotting cumulative particle frequency against particle size. It has been possible to determine the particle-size distributions of ThO_2, within the range of 0.6 to 200 microns, by this method of analysis. The potentials and limitations of the method as well as other information pertinent to this method are discussed. (auth)

15064 TID-7568(Pt.3)(p.89-97)
Marconi Instruments, Inc., Englewood, N. J.
APPLICATIONS OF FLYING SPOT MICROSCOPY TO THE COUNTING AND SIZING OF SMALL PARTICLES. W. A. Buck. p.89-97 [of] ANALYTICAL CHEMISTRY IN NUCLEAR REACTOR TECHNOLOGY. PART 3. PARTICLE-SIZE ANALYSIS. Second Conference, Gatlinburg, Tennessee, September 29—October 1, 1958. 9p.

A method is described for the application of the flying spot technique to the counting and sizing of micro- and macroscopic particles. Methods are discussed for establishing accurate size groupings quickly and for preventing double counting of particles more than one scan line in one dimension. Actual electronic size-grouping equipment, which utilizes a magnetic, drum-type memory unit combined with anticoincidence circuits, is described in detail, together with the possibilities and limitations of such a system. Possible methods for extending the particle-size range which the unit can accept by means of photographic techniques are also discussed. Some applications are suggested, and possibilities for the future development of this instrument are examined. (auth)

15065 UCRL-8527
California. Univ., Berkeley. Lawrence Radiation Lab.
EFFECT OF PRESSURE ON MASS TRANSFER IN THE GAS PHASE (thesis). Robert Joseph Fallat. Mar. 1959. 53p. Contract W-7405-eng-48. $1.50(OTS).

The suggestions by Lynch and Wilke that the height of a transfer unit (HTU_G) in packed column mass transfer might be expressed as a function of a $\sqrt{p u^2}$ parameter (p = density, u = gas velocity) in place of the more commonly used Reynolds number, and that the Schmidt number be raised to the $\frac{1}{2}$ power instead of the more commonly used $\frac{2}{3}$ power are considered. High pressure studies were carried out using packed beds of solid naphthalene over which air or helium were passed at pressures up to 37.8 atmospheres. It was concluded that $\sqrt{p u^2}$ is inadequate as a parameter in correlating mass-transfer data in the absence of liquid flow over the packing. More study is indicated before the use of either Re or $\sqrt{p u^2}$ is established. The equation for the low pressure data of Lynch and Wilke on packings without liquid flow was shown to be in agreement with other workers. Finally it is pointed out that the concentration gradient as the mass transfer driving potential is more satisfactory for correlation use than the fugacity gradient. (J.R.D.)

15066 UCRL-8658
California. Univ., Berkeley. Lawrence Radiation Lab.
LONGITUDINAL DISPERSION IN PACKED EXTRACTION COLUMNS. Gabriel L. Jacques, John E. Cotter, and Theodore Vermeulen. Apr. 1959. 71p. Contract W-7405-eng-48. $2.50(OTS).

Longitudinal dispersion (axial mixing) was studied for counter-current flow of liquids through packed beds, using six different combinations of packing type and size and bed arrangements. The Péclet number, used as a dimensionless measure of the longitudinal dispersion coefficient, was measured in both the continuous and the discontinuous phase of the systems kerosene in water, water in kerosene, and water in mineral oil. The observed values ranged from 100 to 10% of the Péclet number measured for the same packing in single-phase laminar flow. Péclet numbers for each phase were correlated as a function of the two flow rates. An effect of packing diameter and sphericity on the continuous-phase Péclet number was also found. Different mechanisms were indicated for dispersion in the discontinuous phase, depending upon whether or not that phase wets the packing. (auth)

15067 UCRL-8731
California. Univ., Berkeley. Lawrence Radiation Lab.
THE ISOTOPE EFFECT IN THE DECARBONYLATION OF BENZOYLFORMIC ACID. Bernice Fingerman and Richard M. Lemmon. Apr. 1959. 9p. Contract W-7405-eng-48. $0.50 OTS.

The C^{14}/C^{12} isotope effect has been measured for the acid-catalyzed thermal decarbonylation of benzolyformic acid. The decarbonylation, which involves the breaking of a C-O bond in the rate-determining step, was found to have a value for $k_{C^{14}}/k_{C^{12}}$ of 0.977. (auth)

15068 WADC-TR-56-331(Pt.III)
Firestone Tire and Rubber Co., Akron, Ohio.
DEVELOPMENT OF HIGH TEMPERATURE RESISTANT RUBBER COMPOUNDS. Period Covered: December 1, 1957 to November 30, 1958. Robert A. Hayes, Floyd M. Smith, Glenn A. Kidder, James C. Henning, Jack D. Rigby, and George L. Hall. Jan. 26, 1959. 82p. Project title: NON-METALLIC AND COMPOSITE MATERIALS. Task title: ELASTOMERIC AND COMPLIANT MATERIALS. Contract AF33(616)-3953. (AD-212903).

Heat-stable elastomers of potential interest for such applications as high temperature aircraft tires, ducting, seals, and flexible connectors were compounded to improve the physical properties required for construction and performance. Improved properties were obtained for compounds of methacrylate rubber, silicone rubber, Viton A and poly (ethylacrylate). Prototype wire tire-cord aircraft tires were constructed from methacrylate and silicone rubbers. Preliminary compounding studies were made with terpolymers of butadiene-acrylonitrile-methylacrylate and epoxy extended polyesters. Non-elastomeric polymers with outstanding thermal stability were prepared by reacting diepoxides with diphenols. (For preceding period see WADC-TR-56-331(Pt.II).) (auth)

15069 WADC-TR-59-151(Pt. I)
Merck Sharp and Dohme Research Labs., Rahway, N. J.
RESEARCH ON SYNTHESIS OF CHEMICAL INTERMEDIATES FOR HIGH TEMPERATURE FLUIDS AND POLYMERS. [Period coverd] July 1, 1957 to March 1, 1959. Robert E. Jones, John D. Garber, Samuel A. Robinson, Gustav A. Stein, and George Gal. May 29, 1959. 45p. Project title: SECONDARY POWER COMPONENTS AND MATERIALS. Task title: HYDRAULIC FLUIDS. Contract AF33(616)-5329.

The preparation was studied of a wide variety of chemical intermediates required for the preparation of high temperature fluids and polymers. The intermediates prepared include organosilanes, chlorotriazines, haloalkanes, amino and nitroaryl ethers, an ester, a phosphonitrilic halide and a tetra substituted urea. The experimental procedures used were adapted from published research on related materials. Reaction conditions and analysis of desired products are given. (auth)

15070 WADC-TR-59-203
Midwest Research Inst., Kansas City, Mo.
HIGH TEMPERATURE METALLO-ORGANIC AND INORGANIC BASE FLUIDS. [Period covered] April 1, 1958 to February 27, 1959. L. W. Breed and F. V. Morriss. Mar. 1959. 34p. Project titles: SECONDARY POWER COMPONENTS AND MATERIALS and NONMETALLIC AND COMPOSITE MATERIALS. Task titles: HYDRAULIC FLUIDS and NEW CHEMICALS AND METHODS. Contract AF33(616)-5718.

A literature retrieval program was initiated to aid in guiding research on high temperature lubricants. A group of about 22,250 IBM punchcards has been prepared, each card representing a different inorganic or metalloorganic compound. For each compound one card was prepared which included the literature source, the empirical formula, formula weight, structural codes, and the boiling point, melting point, liquid range, and thermal stability, provided one or more of the last four items were known. These data were obtained from an extensive search of the chemical literature and government research reports. Preliminary analysis of the data is described as well as a discussion of the limitations of data correlation programs with particular emphasis on their application in this program. (auth)

15071 Y-1254
Union Carbide Nuclear Co., Y-12 Plant, Oak Ridge, Tenn.
PREPARATION OF LITHIUM ISOTOPE STANDARDS. I. SEPARATION OF SODIUM AND LITHIUM BY DOWEX 50-X16 DVB RESIN. W. C. Dietrich and R. E. Barringer. May 14, 1959. 15p. Contract W-7405-eng-26. $0.50(OTS).

In support of the lithium isotope standards program, a procedure is presented for the separation of sodium from lithium in a hydrochloric acid medium. This separation is effected by a Dowex 50-X16 DBV ion exchange column under conditions of high resolution chromatography. (auth)

15072 AEC-tr-3709
PHOTO-ELECTRIC SPECTROPHOTOMETRY.
G. Kortüm. Translated from Angew. Chem. 50, 193-204(1937). 27p. $9.30(ph), $3.60(mf) JCL.

A review of photo-electric spectrophotometry is presented. Subjective, photographic, and photoelectric methods of measurement and their appropriate use are discussed as well as the principles involved in photoelectric methods. Basic principles considered include the spectral uniformity of light, applications of photocells, measurement reduction in light, and amplification of the photo-current. Various forms of measuring devices and their applications are also discussed, using diagrams. 57 references. (J.R.D.)

15073 AEC-tr-3735
NITRIC ACID OXIDATION KINETICS. [PART] II.
E. Abel. Translated by K. S. Bevis (Savannah River Lab.) from Monatsh. Chem. 89, 79-82(1958). 4p. $1.80(ph), $1.80(mf) JCL.

A discussion is presented of the mechanism and kinetics of oxidation by nitric acid in the presence not only of nitrous acid but also nitric oxide. (auth)

15074 CEA-tr-A-289
DOSAGE DE L'ION FLUOR PAR UNE SOLUTION DE SULFATE DOUBLE D'ALUMINIUM ET DE POTASSIUM. (Determination of Fluorine Ion by a Double Aluminum and Potassium Sulfate Solution.) R. Schliers. Translated into French by B. Moreau from Z. anal. Chem. 150, 321-8(1956). 13p.

A modified version of the Kurtenacker and Jurenka method (Z. anal. Chem. 82, 210 (1930)) was used for the potentiometric determination of fluoride. In the modification alcohol was added and the standardized solution of $AlCl_3$ was replaced by a solution of $KAl(SO_4)_2$. The reaction $6\ NaF + KAl(SO_4)_2 \rightarrow Na_3(AlF_6) + Na_2SO_4 + KNaSO_4$ proceeds stoichiometrically in the conditions used. Good results were obtained. The value corresponding to a blank test and found experimentally previously was established theoretically. The indicators used were mixed bromocresol purple and bromothymol blue and mixed methyl red and methylene blue. A study of the effect of foreign ions showed that this method has relatively few faults with respect to interfering ions. (tr-auth)

15075 CEA-tr-I-23
PRÉPARATION ET COMPORTEMENT DE QUELQUES CATALYSEURS LORS DE LA RÉACTION D'ÉCHANGE ISOTOPIQUE ENTRE L'HYDROGÈNE ET LA VAPEUR D'EAU DANS LE DEUTÉRIUM. (Preparation and Behavior of Some Catalysts During the Isotopic Exchange Reaction of Deuterium Between Hydrogen and Water Vapor.) B. Brigoli, E. Cerrai, R. Renzoni, and M. Silvestri. Translated into French from Nuovo cimento (10) 5, Suppl. No. 3, 479-539(1957). 109p.

This paper was previously abstracted from the Italian and appears in NSA, Vol. 12, as abstract No. 1248.

15076
RAPID SEPARATION OF RADIOACTIVE STRONTIUM BY SOLVENT EXTRACTION WITH TTA—HEXONE. Toshiyasu Kiba and Shigeru Mizukami (Kanazawa Univ., Japan). Bull. Chem. Soc. Japan 31, 1007-13(1958) Dec.

Radioactive strontium in mixed fission products was rapidly separated by a two-step extraction. The solution of the material was first adjusted to pH 7 and extracted with 0.05 m TTA—benzene. By this treatment rare earths and yttrium were made to go into the organic phase out of the solution. The remaining aqueous phase was transferred into another separatory funnel, adjusted to pH 8, and extracted with 0.05 m TTA—hexone. In this case the radioactive strontium was completely extracted into the organic phase. Less than 5% of ruthenium present in the solution was extracted at the same time. Detailed data of the experiments on the extraction involving the determination of distribution coefficient, and the equilibrium constant were tabulated. (auth)

15077

SEPARATION OF FISSION PRODUCTS BY LIQUID–LIQUID EXTRACTION WITH CUPFERRON–CHLOROFORM. Toshiyasu Kiba and Mitsue Kanetani (Kanazawa Univ., Japan). Bull. Chem. Soc. Japan 31, 1013-16(1958) Dec.

To separate the radioactive strontium and cesium from solutions containing gross fission products and other non-radioactive metallic ions, cupferron–chloroform extraction was performed. By changing the acidity of the aqueous solution from 1 n hydrochloric acid to pH 4, and by performing extractions in each stage, the strontium and the cesium remained in the aqueous phase, while the other was removed into the organic phase. The radioactive strontium may be extracted in the organic phase by the following extraction with TTA–hexone at pH 8.

15078

SEPARATION OF RADIOACTIVE CESIUM IN BIOLOGICAL MATERIALS. Noboru Yamagata and Toshiko Yamagata (Gunma Univ., Kiriu, Japan). Bull. Chem. Soc. Japan 31, 1063-8(1958) Dec.

A separation method for cesium-137 in biological materials is presented. The chemical steps include, phosphate elimination, ammonium phosphomolybdate precipitation and chloroplatinate precipitation. The over-all yield of cesium is over 85% and the decontamination from other fission activities is more than 10^5 for cerium-144 and strontium-89. The contribution of the activities of rubidium-87 and potassium-40 is negligibly small in the determination of cesium-137 in biological materials by beta counting. (auth)

15079

SYNTHESIS OF SPECTROSCOPICALLY PURE DEUTERATED TOLUENE $C_6H_5CD_3$. Jacques Valade, Raymond Calas, Nelson Fuson, and Marie-Louise Josien (Centre de Physicochimie structurale, Faculté des Sciences, Bordeaux). Compt. rend. 248, 3003-4(1959) May 25. (In French)

Spectroscopically pure $C_6H_5CD_3$ was synthesized from phenyllithium and CD_3Br. The preparation of CD_3Br is briefly described. The phenyllithium is transferred under an atmosphere of dry nitrogen to an autoclave cooled to −80°C. The CD_3Br is rapidly added, and the autoclave is brought slowly to room temperature, with agitation. It is then maintained at 100°C for 10 hr and cooled. The contents are hydrolyzed and extracted with ether. A first distillation leads to $C_6H_5CD_3$ contaminated with benzene from the hydrolysis of excess phenyllithium. Two new fractionations are made with a column containing 40 theoretical plates. The compound obtained boils at 108°C under normal pressure, corresponding to $C_6H_5CD_3$ of at least 99.5% purity. The infrared spectrum is given. (J.S.R.)

15080

RATES OF DISSOLUTION AND PASSIVATION OF HAFNIUM-FREE ZIRCONIUM IN HYDROFLUORIC ACID. Martin E. Straumanis and William J. James (Univ. of Missouri, Rolla) and Alfred S. Neiman (Stanford Research Inst., Menlo Park, Calif.). Corrosion 15, 286t-90t(1959) June.

The dissolution reaction of Zr in HF is: $Zr + 4H^+ \rightarrow Zr^{4+} + 2H_2$. The over-all rate of dissolution V at 25°C and under the conditions of the experiments is much faster than that of Ti, and is a linear function of the HF concentration (up to N = 0.5): $V = 2000\ N\ mm^3cm^{-2}min^{-1}$. A black hydride film is formed on Zr during its dissolution. Fluoride additions (NH_4F, KF, NaF) to the acid initially increase the rate of dissolution. When added in greater amounts, passivation of Zr is caused which is quite complete for NaF additions. The order of increasing effectiveness is $NH_4F \rightarrow KF \rightarrow NaF$, apparently caused by the decreasing solubility of fluozirconate salt film formed on the metal. Potential measurements of Zr in HF showed an approach to a steady potential of about −0.74 volt with increasing concentration of the acid. The potential time curves had in general a logarithmic shape, the potential becoming more positive with elapsing time. Fluoride additions caused a breakdown of the initial film, formed during dissolution in pure HF, and a sudden drop of potential down to −1.112 volt (in 6.5 M NH_4F). The potential gradually became more positive, because of the salt film formation on the surface of Zr, until a steady potential was reached. Of the three additions, NaF produced and the most positive potential (−0.528 volt) and a complete passivation of Zr. (auth)

15081

A NEW SERIES OF POLYMORPHOUS TRANSFORMATIONS OF Na_2BeF_4. A. V. Novoselova, Yu. V. Orlova, Yu. P. Simanov, and L. M. Kovba (Lomonosov Moscow State Univ.). Doklady Akad. Nauk S.S.S.R. 126, 93-6 (1959) May 1. (In Russian)

The thermographic and x-ray studies of acicular crystals of Na_2BeF_4, prepared from an aqueous solution, showed that this is a new modification δ Na_2BeF_4 with the specific gravity $d^{18} = 2.406 \pm 0.002$. Thermograms and x-ray tables comparing δ Na_2BeF_4 and γ Na_2BeF_4 transformations are included. (R.V.J.)

15082

SOLUBILITY IN THE Na, Mg || Cl, $HCO_3 - H_2O$ SYSTEM. A. M. Ponizovskii and N. M. Vladimirova (Inst. of Mineral Resources, Adademy of Sciences, Ukrainian, S.S.R., Simferopol). Doklady Akad. Nauk S.S.S.R. 126, 97-8(1959) May 1. (In Russian)

Data are presented on the solubility in the system Na, Mg || Cl, $HCO_3 - H_2O$, at P_{CO_2} of 4 atm and 0°C. (R.V.J.)

15083

THE MASS SPECTRA OF CHROMYL CHLORIDE, CHROMYL CHLOROFLUORIDE AND CHROMYL FLUORIDE. Gerald D. Flesch and Harry J. Svec (Iowa State Coll., Ames). J. Am. Chem. Soc. 81, 1787-90(1959).

The results of a mass spectrometric study of CrO_2Cl_2, CrO_2ClF, and CrO_2F_2 are reported. The fragmentation patterns of each compound in the normal and dimeric mass range and the appearance potentials of the positive ion fragments of CrO_2Cl_2 and CrO_2F_2 are given. A method of taking appearance potential data is presented which results in the appearance potential curves of all fragments having nearly identical slopes and also permits taking data when the ion currents are changing slowly. (auth)

15084

DISTRIBUTION OF FLUORIDE IN THE NORMAL DOG FEMUR. Dwight E. Gardner, Frank A. Smith, Harold C. Hodge, Finn Brudevold, and Donald McG. Eldredge (Univ. of Rochester, N. Y.). J. Appl. Physiol. 14, 427-30(1959) May.

Longitudinal sections and concentric layers of normal dog femurs were analyzed for their fluoride contents. Longitudinally, fluoride is deposited in greatest concentrations in the epiphyseal regions, i.e., the regions of vascularity and active growth. Concentrations in these regions are approximately twofold greater than at the mid-point of the diaphysis. In cross section, fluoride is also deposited in greater concentrations in the areas of more rapid growth and better blood supply, i.e., on the periosteal and endosteal surfaces of the shaft. The pattern of deposition is similar in adult and young bone, though fluoride concentrations are appreciably greater in the adult bone. The pattern of distribution conforms with the accepted principles of deposition of other boneseeking elements. (auth)

15085

CHEMICAL PROCESSES. J. M. Kay (Imperial Coll. of Science and Tech., [London]). J. Brit. Nuclear Energy Conf. 4, 131-44(1959) Apr.

Second Geneva conference papers on the more important processes peculiar to the nuclear energy industry are discussed in three parts; production of nuclear materials; processing of fuel from thermal reactors; and processing of concentrated fissile materials. (T.R.H.)

15086

NUCLEAR MAGNETIC RESONANCE SPECTRA OF SOME DIALKYLMERCURY COMPOUNDS. Raymond E. Dessy, H. H. Jaffé, and G. F. Reynolds (Univ. of Cincinnati) and T. J. Flautt (Proctor and Gamble Co., Cincinnati). J. Chem. Phys. 30, 1422-5(1959) June.

The Hg^{199} and H^1 nuclear magnetic resonance spectra of a series of dialkylmercury compounds have been obtained. The Hg^{199} results indicate that the shielding of the mercury increases along the series Me < n – Pr < Et < i – Pr. This increased shielding seems to be connected with an interaction of Hg^{199} and the β protons, as evidenced by the H^1 resonance peaks and the $Hg^{199} - H^1$ spin-spin coupling constants. (auth)

15087

THERMAL EXPANSION OF (UN), (UO_2), ($UO_2 \cdot ThO_2$), AND (ThO_2). Charles P. Kempter and Reed O. Elliott (Los Alamos Scientific Lab., N. Mex.). J. Chem. Phys. 30, 1524-6(1959) June.

The thermal expansion characteristics of polycrystalline (UN), (UO_2), ($UO_2 \cdot ThO_2$) solid solution, and (ThO_2) were determined between room temperature and ~ 1000°C by means of x-ray diffraction techniques. For the range 26° to 1000°C, the values of the average linear thermal expansion coefficients ($\alpha \times 10^6$/°C) are 8.61, 10.52, 10.18, and 9.32, respectively. A comparison of the observed ($UO_2 \cdot ThO_2$) lattice constants with those calculated indicates that the solid solution becomes less ideal as the temperature increases. (auth)

15088

ELECTRON SPIN RESONANCE IN AN IRRADIATED SINGLE CRYSTAL OF DIMETHYLGLYOXIME. Ichiro Miyagawa and Walter Gordy (Duke Univ., Durham, N. C.). J. Chem. Phys. 30, 1590-5(1959) June.

The paramagnetic resonance of gamma-irradiated single crystals of dimethylglyoxime has been measured at 23 kMc/sec and 9 kMc/sec for various orientations of the crystal in the magnetic field. The resonance pattern was found to have a triplet structure caused by coupling to a single N^{14} nucleus. Both the nuclear coupling and the spectroscopic splitting factor were found to be anisotropic with the principal values; $A_1 = 45 \pm 1$ gauss, $A_2 = A_3 = 25 \pm 1$ gauss, $g_1 = 2.0026 \pm 0.0003$, $g_2 = 2.0063 \pm 0.0003$, and $g_3 = 2.0095 \pm 0.0003$. It is concluded that the free radical produced by the irradiation is probably the ionized dimethylglyoxime molecule with the positive charge and the electron spin density concentrated on one of the nitrogens and in an hybridized sp^2 orbital which is approximately in the molecular plane and along the bisector of the $C = N - O$ angle. The s character in the orbital is calculated from the N^{14} coupling to be 19%. (auth)

15089

EPR STUDIES OF ELECTRON IRRADIATED ICE AND SOLID HYDROGEN. L. H. Piette, R. C. Rempel, and H. E. Weaver (Varian Associates, Palo Alto, Calif.) and J. M. Flournoy (Aerojet General Corp., Azusa, Calif.). J. Chem. Phys. 30, 1623-4(1959) June.

Electron paramagnetic resonance studies of ice and H_2 irradiated in a 40-Mev electron linear accelerator are described. For ice at 77°K and dosages of 9×10^6 and 18×10^6 rad, a strong resonance at $g = 2$ consisting of a doublet and other unresolved lines was observed; no H atom splitting was observed. At 4.2°K and various dosages (cumulative) resonances 250 gauss each side of $g = 2$ appeared; the same unresolved structure in the $g = 2$ region was found. A maximum total H atom concentration of 8×10^{-6} moles was obtained at 16×10^6 rad. Higher doses produced no more H atoms. For solid H_2 at 4.2°K only H-atom lines were observed. Modulation frequency effects at high rf levels were studied. Dose saturation study indicated H-atom concentration saturation at 7.2×10^6 rad; the H-atom concentration was 1.5×10^{-6} mole/g. The saturation level may have been limited by beam heating effects. (T.R.H.)

15090

EFFECTS OF THE Co^{59} hfs ON THE F^{19} HIGH-FREQUENCY NMR IN ANTIFERROMAGNETIC CoF_2. V. Jaccarino (Bell Telephone Labs., Murray Hill, N. J.). J. Chem. Phys. 30, 1627-8(1959) June.

In studying the T_1^{19} relaxation time of h-f NMR of F^{19} in antiferromagnetic CoF_2, evidence for existence of a considerable hfs of the Co^{59} nuclei was found, and the hfs was observed directly. (T.R.H.)

15091

ANALYSIS OF THE SPECTRA OF GADOLINIUM SALTS. W. A. Runciman (Univ. of Canterbury, Christchurch, N. Z.). J. Chem. Phys. 30, 1632-3(1959) June.

The effect of the spin-orbit interaction between sextet and quartet states in Gd spectra is considered. Russell-Saunders energy levels were found for all the quartet states using the hydrogenic approximation for the shape of the 4f wave function. The basic states in Racah's classification for the three highest multiplicities of f^7 and the spin-orbit matrix elements are given. The ^6P and ^6I levels calculated in units of F_2 are tabulated. (T.R.H.)

15092

COMBUSTION OF ARTIFICIAL GRAPHITE UNDER LOW OXYGEN PRESSURES. II. RELATION BETWEEN THE PRODUCTION SPEEDS OF CO AND CO_2. L. Bonnetain (Faculté des Sciences, Nancy, France). J. chim. phys. 56, 486-94(1959) May. (In French)

In the combustion of artificial graphite at temperatures between 430 and 700°C and at oxygen pressures of 10^{-2} mm Hg, the oxides CO and CO_2 are the primary products produced. When the combustion velocity evolves at constant temperature and pressure, following degassing, there is a linear relationship or proportionality (according to the graphite) between the formation velocities of CO and of CO_2; in a V_{CO} vs. V_{CO_2} diagram, the experimental points are placed on the straight line called the "combustion line." The slope of these lines is independent of the pressure of the oxygen in a certain pressure region. The values of the slopes, which vary with the temperature (thermal coefficient of 6 kcal), are equally sensitive for the different graphites studied. The chemisorption of low quantities of hydrogen has the effect of diminishing the combustion velocity. The corresponding experimental points are always placed on the same combustion line. (tr-auth)

15093

PAPER ELECTROPHORESIS OF PROTACTINIUM(V). Jacques Vernois (Institut du Radium, Paris). J. Chromatog. 2, 155-61(1959) Mar. (In French)

The electrophoretic behavior of Pa(V), Fe(III), U(VI), Pb(IV), Bi(III), Zr(IV), Ta(V), Nb(V), Th(IV), Ti(IV), and Po(III) in HCl and HCl−HF was studied. In these media protactinium can be separated from some of the above-mentioned elements. (auth)

15094

CHROMATOGRAPHY ON PAPER IMPREGNATED WITH ION EXCHANGE RESINS. IV. THE ADSORPTION OF METAL IONS ON DOWEX-50 FROM DILUTE HF SOLUTION. Michael Lederer (Institut du Radium, Paris). J. Chromatog. 2, 209-10(1959) Mar.

A simple method is described which employs ion exchange papers for determining whether a metal ion in a given solution adsorbs on a cation exchanger. Applications are described in which Dowex-50 or Dowex-50 papers were employed for separating a number of divalent transition elements from Pa(V) or any other of the fast-moving metal ions. Zinc and Cd which complex readily in HCl were strongly adsorbed from HF solution. (C.H.)

15095

AQUEOUS URANIUM CORROSION AT 100°C. J. B. Schroeder, D. A. Vaughan, and C. M. Schwartz (Battelle Memorial Inst., Columbus). J. Electrochem. Soc. 106, 486-9(1959) June.

The mechanism of aqueous uranium corrosion was studied using weight loss and hydrogen evolution measurements. Microscopic x-ray diffraction and chemical analyses were made of the corrosion product. The results indicate that uranium corrodes by forming an oxide of the type UO_{2+x}. The lack of chemical balance reported by earlier workers is explained by the existence of metallic uranium in the oxide layer. (auth)

15096

THE SEPARATION OF HYDROGEN AND DEUTERIUM BY THE REACTION OF IRON WITH WATER. Hilton A. Smith, Carl O. Thomas, and John C. Posey (Univ. of Tennessee, Knoxville). J. Electrochem. Soc. 106, 516-19(1959) June.

In the decomposition of water by reaction with iron, as in the electrolysis of water, the residual water is enriched in deuterium. Since the separation factor is an inverse function of the temperature, an attempt was made to increase the reaction rate at low temperatures. Introduction of cathodic surfaces by partial plating of cathodic impurities on steel increased the reaction rate by a factor of 2 to 4 at 98-100°C. Separation factors from 4.8 to 6.1 were observed for the chemical reaction of these partially plated samples with water. In electrolysis experiments vigorous agitation of the electrolyte caused an increase in the separation factor. (auth)

15097

RECTIFICATION BY ZIRCALOY 2 IN HIGH-TEMPERATURE WATER. J. N. Wanklyn and R. Aldred (Atomic Energy Research Establishment, Harwell, Berks, Eng.). J. Electrochem. Soc. 106, 529(1959) June.

Recent corrosion tests of Zircaloy 2 under heat transfer in water at pH 10.5, 280°C, were vitiated by rectification effects. Strips of the material were heated by the passage of a large 50 cps alternating current, and this involved a voltage of about 12 v rms between the specimen and the wall of the apparatus. Corrosion was unexpectedly great, white oxide forming in less than 200 hr, and much hydrogen was taken up by the Zircaloy 2. (auth)

15098

SYNTHETIC INORGANIC ION-EXCHANGE MATERIALS. III. THE SEPARATION OF RUBIDIUM AND CAESIUM ON ZIRCONIUM PHOSPHATE. C. B. Amphlett and L. A. McDonald (Atomic Energy Research Establishment, Harwell, Berks, Eng.); and J. S. Burgess and J. C. Maynard (Radiochemical Centre, Amersham, Bucks., Eng.). J. Inorg. & Nuclear Chem. 10, 69-73(1959) Apr.

Rubidium and cesium may be efficiently separated in macro-quantities on columns of zirconium phosphate, at loadings up to 10%, by elution with solutions of ammonium salts or of nitric acid. High yields of pure materials are obtained if the separation is performed at elevated temperatures. The results are compared with those for organic resins and for other inorganic exchangers. (auth)

15099

THE FLUORIDES OF URANIUM. III. KINETIC STUDIES OF THE FLUORINATION OF URANIUM TETRAFLUORIDE BY FLUORINE. V. Y. Labaton and K. D. B. Johnson (United Kingdom Atomic Energy Authority, Capenhurst Works, Chester, Eng.). J. Inorg. & Nuclear Chem. 10, 74-85(1959) Apr.

The reaction between uranium tetrafluoride and fluorine was studied between 265 and 348°C by following the change in weight of the solid phase, using a spring balance. Formation of uranium hexafluoride at the solid surface is accompanied by migration of fluorine ions into the UF_4 lattice. The rate of production UF_6 is in agreement with the kinetics expected for reaction between a gas and a solid at a continuously diminishing spherical interface. The rate of reaction depends on the temperature; no reaction is detectable below 220°C. Within the limits of experimental accuracy the Arrhenius equation relates the reaction-rate constant and the temperature of reaction: the activation energies determined for three preparations of UF_4 were 15.5, 19.1, and 19.9 kcal per mole. A linear relationship is shown to exist between the reaction rate and partial pressure of fluorine, but within the range examined the reaction rate is not affected by the velocity of gaseous reactant past the solid. The rate of UF_6 production is dependent on an "effective" surface area of UF_4, rather than the surface area determined by gaseous adsorption. (auth)

15100

THE FLUORIDES OF URANIUM. IV. KINETIC STUDIES OF THE FLUORINATION OF URANIUM TETRAFLUORIDE BY CHLORINE TRIFLUORIDE. V. Y. Labaton (United Kingdom Atomic Energy Authority, Capenhurst Works, Chester, Eng.). J. Inorg. & Nuclear Chem. 10, 86-93(1959) Apr.

The reaction between uranium tetrafluoride and chlorine trifluoride was studied between 17 and 193°C using the same basic technique as was used in an investigation of the uranium tetrafluoride-fluorine reaction. This consists essentially of following the change in weight of the solid phase using a spring balance. The mechanism and kinetics of reaction were shown to be substantially the same for chlorine trifluoride as fluorine. The reaction rate passes through a maximum at 105°C, falls to a minimum at 148°C and then rises again. An explanation of this unusual behavior is suggested. In the regions 17 to 58°C and 156 to 194°C, within the limits of experimental accuracy, the Arrhenius equation relates the reaction-rate constant and the temperature of reaction; the activation energies determined for uranium tetrafluoride prepared by hydrofluorination were 5.6 and 3.4 kcal per mole, respectively. A linear relationship is shown to exist near ambient temperature between the reaction rate and partial pressure of chlorine trifluoride. In the velocity range examined, gas velocity had no effect on the reaction rate. (auth)

15101

KINETICS OF THE OXIDATION OF CERIUM (III) BY CONCENTRATED NITRIC ACID. R. W. Johnson and D. S. Martin, Jr. (Iowa State Coll., Ames). J. Inorg. & Nuclear Chem. 10, 94-102(1959) Apr.

The oxidation of Ce^{3+} by concentrated nitric acid solutions was shown to be a reversible reaction. The kinetics for the oxidation at 90 to 110°C in 12 to 16 N HNO_3 were studied by a procedure in which volatile oxides of nitrogen were swept away by inert gas. The kinetics were consistent with an electron transfer reaction between Ce^{3+} and NO_2^+, first order in each reactant. An over-all activation energy for the process of 8 kcal was indicated. (auth)

15102

THE COPRECIPITATION OF RARE EARTHS WITH CALCIUM OXALATE. B. C. Purkayastha and S. N. Bhattacharyya (Inst. of Nuclear Physics, Calcutta). J. Inorg. & Nuclear Chem. 10, 103-9(1959) Apr.

The mechanism of the uptake of rare earths by calcium oxalate was studied in detail. Yttrium-91, Eu^{152}, and Eu^{154} were used to obtain evidence of mixed crystal formation. It was found that, out of the three hydrates of calcium oxalate claimed by earlier workers, it is calcium oxalate dihydrate which carries rare earths through mixed crystal formation. The uptake of rare earths by calcium oxalate monohydrate follows a Freundlich adsorption isotherm. (auth)

15103

THE CHEMISTRY OF URANYL NITRATE—HYDROXIDE—UREA SYSTEMS. P. S. Gentile, L. H. Talley, and T. J. Collopy (National Lead Co. of Ohio, Cincinnati). J. Inorg. & Nuclear Chem. 10, 110-13(1959) Apr.

The reaction mechanism was determined for addition of ammonium hydroxide or sodium hydroxide to a solution of uranyl nitrate and urea. Evidence is presented to show that nitrouranic acid $[UO_2(NO_3)OH]$ and hydrated uranic acid $(H_2UO_4.H_2O)$ are intermediate compounds. Finally, a discussion of the relationship of these intermediates to the chemistry of uranates is presented. (auth)

15104

SOME EVIDENCE FOR THE PRESENCE OF URANIC ACID IN URANIUM TRIOXIDE—WATER SYSTEMS. P. S. Gentile, L. H. Talley, and T. J. Collopy (National Lead Co. of Ohio, Cincinnati). J. Inorg. & Nuclear Chem. 10, 114-16(1959) Apr.

The hydrates, $UO_3.2H_2O$, $UO_3.0.8H_2O$, and $UO_3.0.5H_2O$ were shown to react with the organic base, urea, to form urea uranate $H_2UO_4.2CO(NH_2)_2$. The formation of this salt provides evidence that these "hydrates" constitute a series of acids whose relationship may be expressed as follows: $H_2UO_4.H_2O \xrightarrow{100°C} H_2UO_4 \xrightarrow{160°C} H_2U_2O_7$ (pyrouranic acid). Attempts to characterize the "hydrate" $UO_3.0.8H_2O$ were unsuccessful; instead the presence of a mixture of H_2UO_4 and $H_2U_2O_7$ was indicated. (auth)

15105

THE EXTRACTION OF NITRATES BY PHOSPHORYLATED REAGENTS. I. THE RELATIVE EXTRACTION RATES AND SOLVATING MECHANISMS FOR URANYL NITRATE. T. V. Healy and J. Kennedy (Atomic Energy Research Establishment, Harwell, Berks, Eng.). J. Inorg. & Nuclear Chem. 10, 128-36(1959) Apr.

The partitioning of uranyl nitrate between a number of non-ionic phosphorylated reagents and dilute nitric acid was measured. Experiments at varying concentrations of the extractants (S) in an inert diluent such as benzene indicate that in most cases the disolvates $UO_2(NO_3)_2$ 2S are formed. Non-ionic reagents containing the diphosphoryl group $=P(O)-Y-(O)P=$, (where Y is oxygen, methylene, or ethylene) also give disolvates when the latter are in large excess of the uranium, but when saturated with uranyl nitrate the solvates $[UO_2(NO_3)_2S]_n$, which are probably polymeric, predominate. The implications of these results are discussed. Electronegative or base weakening substituents on the phosphoryl group decrease the partition coefficient, and that obtained with triphenyl phosphate is almost six orders of magnitude lower than the partition obtained with tributyl phosphine oxide. Preliminary experiments with di-n-butyl phosphoric acid, indicate that this reagent extracts uranium by a chelating mechanism accompanied by hydrogen ion liberation from solutions low in nitric acid (< 3.0 M), and by a solvating mechanism similar to that with non-ionic reagents at higher aqueous acid concentrations. The structure of the uranyl dibutyl phosphate complex is discussed. (auth)

15106

THE EXTRACTION OF NITRATES BY PHOSPHORYLATED REAGENTS. II. THE RELATIVE EXTRACTION RATES OF URANYL, COBALTOUS, AND SODIUM NITRATES WITH PHOSPHATE ESTERS. T. V. Healy, J. Kennedy, and G. M. Waind (Atomic Energy Research Establishment, Harwell, Berks, Eng.). J. Inorg. & Nuclear Chem. 10, 137-47(1959) Apr.

The partition of uranyl, cobaltous, and sodium nitrate between non-ionic phosphate esters and water was measured, and the deviations from ideality which occur at high nitrate concentrations in the organic phase were used to obtain solvation numbers for the extracted salts. With tri-n-butyl phosphate (TBP), the extracted species are the di-solvates, $UO_2(NO_3)_2 \cdot 2TBP$, and the tri-solvates $Co(NO_3)_2 \cdot 3TBP$ and $NaNO_3 \cdot 3TBP$. Tri-solvates are also formed between uranyl nitrate and weak phosphate ester extractants such as diphenyl butyl and triphenyl phosphates. (auth)

15107

OBSERVATIONS ON THE RARE EARTHS. LXIX. AN ELECTROCHEMICAL INVESTIGATION OF ETHYLENEDIAMINE SOLUTIONS OF LANTHANUM NITRATE. T. Moeller and G. W. Cullen (Univ. of Illinois, Urbana). J. Inorg. & Nuclear Chem. 10, 148-52(1959) Apr.

The solubility of anhydrous lanthanum nitrate in ethylenediamine is markedly dependent upon the water content of the latter. Conductance data for both completely anhydrous solutions and those containing controlled quantities of water show generalized weak electrolyte behavior. Electrolyses of such solutions yield cathode deposits that apparently contain small quantities of elemental lanthanum. X-ray characterization of such deposits is negated by oxide absorption of radiation diffracted by the metal. Some of the techniques essential to handling materials under anhydrous conditions are described. (auth)

15108

AN APPARATUS FOR THERMOGRAVIMETRY IN HAZARDOUS ATMOSPHERES. L. G. Stonhill (Eldorado Mining and Refining Ltd., Ottawa). J. Inorg. & Nuclear Chem. 10, 153-8(1959) Apr.

A detailed description is given of the construction and operation of an apparatus, incorporating a commercial pen-recording thermobalance, designed for the study of reactions involving hazardous gases. A leak for water-soluble gases has been designed especially for use with the assembly. (auth)

15109

COMPOSITION AND STABILITY CONSTANT OF A COMPLEX OF CERIUM AND AMMONIUM CITRATE AT ALKALINE pH. R. S. Leal (C.E.E.N., Lisbon). J. Inorg. & Nuclear Chem. 10, 159-61(1959) Apr.

The composition and stability constant of a complex of cerium and citrate ion were determined by the ion exchange method. The adsorbent used was Zeocarb-225, in the NH$_4^+$ form and 70/100 mesh size. (W.L.H.)

15110

SEPARATION OF GADOLINIUM FROM ^{235}U FISSION PRODUCT RARE EARTHS. Aviezer Stevan Kertes (Hebrew Univ., Jerusalem). J. Inorg. & Nuclear Chem. 10, 161-4(1959) Apr.

A procedure is described for the separation of micro quantities of Gd from other natural uranium fission product rare earths. (W.L.H.)

15111

ON THE PREPARATION OF ANHYDROUS DEUTERIUM FLUORIDE FROM FLUOROSULPHONIC ACID AND HEAVY WATER. G. A. Olah and S. J. Kuhn (Dow Chemical of Canada, Ltd., Sarnia, Ont.). J. Inorg. & Nuclear Chem. 10, 164-5(1959) Apr.

It was found that fluorosulfonic acid is a very convenient source of deuterium fluoride by the simple deuterolysis reaction: $FSO_3H + D_2O \rightarrow DF + DHSO_4$. Although only half of the deuterium used is converted to DF, the reaction takes place at moderate temperatures and is practically quantitative at 100°C. (W.L.H.)

15112

THE HIGH TEMPERATURE STABILITY OF OXIDES AND SULPHIDES. D. T. Livey (Atomic Energy Research Establishment, Harwell, Berks, Eng.). J. Less-Common Metals 1, 145-51(1959) Apr.

A review of oxide stability is given including a chart in which the free energy of formation is plotted against the atomic number, also physical properties such as melting points and vapor pressures are tabulated. Also, stability of sulfides is discussed and several properties are tabulated. (J.R.D.)

15113

SWELLING AND ELASTICITY OF IRRADIATED POLYDIMETHYLSILOXANES. L. E. St. Pierre, H. A. Dewhurst, and A. M. Bueche (General Electric Co., Schenectady, N. Y.). J. Polymer Sci. 36, 105-11(1959) Apr.

The G value for crosslinking of polydimethylsiloxanes by high energy electrons was redetermined using cryoscopic methods and checked by quantitative determinations of the amounts of gases evolved. The value found, G = 2.5 ± 0.4, is significantly different from that reported previously. The swelling of high polymers crosslinked by high energy electrons was measured using benzene and toluene. The χ_1 values calculated using equilibrium tension and swelling measurements are in good agreement with those obtained from the vapor pressure measurements of Newing. The equilibrium tension measurements indicate that 1 mole of crosslinks produces 1.3 ± 0.3 moles of effective chains between crosslinks in the Wall, Flory, Rehner scheme. This is in agreement with the predictions of Guth and James. (auth)

15114

KINETICS OF THE GAMMA-INDUCED GRAFT COPOLYMERIZATION OF VINYL ACETATE TO TEFLON. A. J. Restaino and W. N. Reed (Martin Co., Baltimore, and Atlas Powder Co., Wilmington, Del.). J. Polymer Sci. 36, 499-510(1959) Apr.

The gamma-induced graft copolymerization of vinyl acetate to films of polytetrafluoroethylene is affected by hydroquinone. A study of the effect of polytetrafluoroethylene film thickness on the rate of grafting indicates that the weight of vinyl acetate grafted is independent of the film thickness. The rate of grafting is observed to be proportional to the three-halves power of the monomer concentration from 2.0 to 10.8 molar vinyl acetate in ethyl acetate, and to the one-half power of the intensity in the range investigated from 15,000 to 460,000 r/hr. After initial grafting there is an increase in the grafting rate. The addition of as much as 15 g./dl. of high molecular weight polyvinyl acetate to the copolymerization mixture has no effect on the initial rate of grafting. The activation energy is found to be 4.78 ± 0.32 kcal./mole (95% confidence limit). A mechanism consistent with these observations is presented. The addition of small quantities of carbon tetrachloride results in a decrease in the rate of grafting as well as a decrease in the molecular weight of the homopolymer formed. The decrease in grafting rate is attributed to a smaller G-value for radical formation of carbon tetrachloride when compared to that for vinyl acetate and to the differential rate of chain transfer between carbon tetrachloride and grafted polyvinyl acetate with vinyl acetate radical. The chain transfer constant of carbon tetrachloride with vinyl acetate radical has been measured with the use of gamma-rays to initiate polymerization. The value is 0.47. (auth)

15115

GAMMA RADIATION-INDUCED SOLUTION POLYMERIZATION OF ETHYLENE. Ernest J. Henley and C. Chong Ng (Columbia Univ., New York). J. Polymer Sci. 36, 511-17(1959) Apr.

Gamma radiation-initiated polymerization of ethylene in solution was studied by measuring the pressure decrease with dose in a batch system. Water, ethanol, benzene, and carbon tetrachloride were used as solvents. The radiation intensity was 134,000 rep/hr. G values and number-average molecular weights were obtained from runs made at room temperature and at initial pressures of 5 to 13 atmospheres. The solvent radical yields and chain transfer constants for these systems were calculated from an expression derived on the assumption of a free radical mechanism with bimolecular termination. (auth)

15116

RADIATION CROSSLINKING EFFICIENCY FOR POLYDIMETHYLSILOXANES. W. Barnes, H. A. Dewhurst, R. W. Kilb, and L. E. St. Pierre (General Electric Co., Schenectady, N. Y.). J. Polymer Sci. 36, 525-6(1959) Apr.

Results on the cross linking efficiency of dimethylsilicones determined by two independent methods; the light scattering method and the bubble entrapment method are reported. The G values are listed and it is noted that they are in substantial agreement with the value G = 2.5 ± 0.4 previously reported. (J.R.D.)

15117

THE FUNDAMENTAL FREQUENCIES OF ALL THE DEUTERATED BENZENES. APPLICATION OF THE COMPLETE ISOTOPIC RULE TO NEW EXPERIMENTAL DATA. Svend Brodersen and A. Langseth (Univ. of Copenhagen). Kgl. Danske Videnskab. Selskab, Mat.-fys. Skrifter 1, No. 7, 1-36(1959).

The complete isotopic rule (Mat. Fys. Skr. Dan. Vid. Selsk. 1, No. 5 (1958)) is used to calculate all the fundamental frequencies of the various partly deuterated benzenes from those of benzene-d_0 and benzene-d_6. The calculated frequencies are compared with new experimental values obtained in this laboratory. All nonplanar frequencies are given by strictly valid rules. In order to calculate the planar frequencies it is necessary to introduce an approximation based on the separation of high and low frequencies. No correction for anharmonicity is required. A detailed discussion is given of the setting up of the rules, especially of the approximate ones. The agreement between calculated and observed frequencies is very satisfactory. Frequencies calculated from strictly valid rules usually agree within 0–3 cm^{-1}), those calculated from approximate rules within 0–10 cm^{-1}. A first order approximation is proposed and shown to be of great value for surveying the changes in vibrational frequencies caused by changes in the isotopic substitution. (auth)

15118

CALIBRATION OF NEUTRON SOURCES. METHODS USED AT THE NATIONAL BUREAU OF STANDARDS. Nuclear Power 4, No. 38, 121(1959) June.

Radium–beryllium (α,n) and plutonium–beryllium (α,n) source preparation and calibration at NBS are described. The National Neutron Source was calibrated two ways: measurement of thermal-neutron density in a tank of water surrounding the source, and measurement of beta activity of Mn in $MnSO_4$ solution surrounding the sample. The arrangement and technique for calibrating neutron fluxes using two sources are described. (T.R.H.)

15119

AN ANALYSIS OF THE FLUORESCENCE SPECTRUM OF NEODYMIUM CHLORIDE. B. R. Judd (Univ. of Oxford). Proc. Roy. Soc. (London) A251, 134-42(1959) May 12.

It is assumed that the effect of the surroundings of a neodymium ion in the trichloride lattice on the 4*f* electrons can be reproduced by a static electric field. The electric potential is expanded in a series of spherical harmonics; because of the point symmetry C_{3h}, only four terms are required. The observed splittings of $^4I_{9/2}$, $^4I_{3/2}$ and $^4I_{11/2}$ are fitted to within 2.5 cm^{-1} by varying the coefficients of the four spherical harmonics. The coefficients obtained thereby are compared to the corresponding ones for $PrCl_3$, and the importance of configurational interaction is discussed. Intermediate coupling effects and crystal field interactions between the levels are taken into account in the calculations. (auth)

15120

ION-MOLECULE REACTIONS OF METHYL AND ETHYL IODIDES. R. F. Pottie, R. Barker, and W. H. Hamill (Univ. of Notre Dame, Ind.). Radiation Research 10, 664-70(1959) June.

Ion-molecule reactions from methyl iodide, ethyl iodide, and their mixture were observed in the mass spectrometer. Appearance potentials of the important primary ions and of all secondary ions and the reaction cross sections were measured. (auth)

15121

THE PLASMA JET AS A SPECTROSCOPIC SOURCE. M. Margoshes and B. F. Scribner (National Bureau of Standards, Washington, D. C.). Spectrochim. Acta No. 2, 138-45(1959) Apr.

The plasma jet utilizes electromagnetic and thermal pinch effects to form an arc plasma into a flame-like cone of high energy. The plasma produced in the discharge chamber is constricted and carried through a circular opening in the cathode by a stream of fluid such as helium, resulting in a jet of hot partially ionized gas. For application as a spectroscopic excitation source, a plasma jet was designed to operate with moderate currents (15 to 20 A) from a conventional d-c arc power supply and to include an atomizer to spray a solution through the anode into the discharge. The source excites spark-like spectra, indicating a high excitation temperature. Applied to the spectrographic analysis of stainless steel for iron, chromium, and nickel, the results exhibited a coefficient of variation of about 2 per cent, including the photometric error. The plasma jet offers promise as a reproducible means of high energy excitation of solutions and of liquids in general. (auth)

15122

THE MAGNITUDE OF ELECTRONIC ISOTOPE EFFECTS. R. E. Weston, Jr. (Brookhaven National Lab., Upton, N. Y.). Tetrahedron 6, 31-5(1959).

Secondary isotope effects, i.e., kinetic isotope effects in reactions where the bond to the labeled atom is not broken, are now being widely used for investigations of organic reaction mechanisms. In a recent paper, Halevi discussed secondary hydrogen isotope effects, and has suggested that there is an inductive contribution to such isotope effects. In particular, it is suggested that electron release from a C–D bond is more facile than from a C–H bond. The evidence cited by Halevi is examined, and the theoretical limitations on such an effect are estimated. (auth)

15123

THE CHEMISTRY OF THE ACTINIDE ELEMENTS. Joseph J. Katz and Glenn T. Seaborg. London, Methuen and Co., Ltd., 1957. 520p.

The actinide elements are treated thoroughly, including important literature citations up to 1956. Sections on Ac, Th, U, Pa, Np, Pu, Am, Cu, and transcurium elements are presented which give information on history, isotopes, occurrence and isolation, properties, compounds, and properties of compounds. A final summarizing and correlating section is given. Data on atomic weights, x-ray energies, and nuclear spins of the actinide nuclides are appended. (T.R.H.)

15124

PROGRESS IN NUCLEAR ENERGY. SERIES IX. ANALYTICAL CHEMISTRY. VOLUME I. M. T. Kelley. New York, Pergamon Press, 1959. 388p. $15.00.

Twenty six papers are presented. These papers cover the fields of reactor applications, activation analysis, spectrographic techniques, industrial application, and health physics. (W.L.H.)

15125

IMPROVEMENTS IN OR RELATING TO THE TREATMENT OF ARTICLES MADE OF POLYETHYLENE. Robert Michael Scarisbrick (to United Kingdom Atomic Energy Authority). British Patent 813,930. May 27, 1959.

Polyethylene containers may be marked permanently by applying an oil soluble dye with thickener and solvent, letting it dry, and heating in a gas flame to 100 or 120°C. The dye penetrates the polyethylene making a permanent mark. (T.R.H.)

15126

METHOD OF TESTING HERMETIC CONTAINERS. L. B. Borst (to U. S. Atomic Energy Commission). U. S. Patent 2,873,603. Feb. 17, 1959.

A method is presented for testing hermetic containers enclosing a material capable of chemically combining with a fluid at elevated temperatures. In accordance with the invention, the container to be tested is weighed together with the material therein. The container and its contents are then immersed in the fluid and heated to a temperature sufficiently high to cause a reaction to take place between the contents and the fluid and maintained under such conditions for a definite period of time. The container and its contents are then cooled and re-weighed. The rate of change in weight is determined and utilized as an index to determine the possibility of container failure.

15127

OXIDATION OF TRANSURANIC ELEMENTS. R. L. Moore (to U. S. Atomic Energy Commission). U. S. Patent 2,874,025. Feb. 17, 1959.

A method is reported for oxidizing neptunium or plutonium in the presence of cerous values without also oxidizing the cerous values. The method consists in treating an aqueous 1N nitric acid solution, containing such cerous values together with the trivalent transuranic elements, with a quantity of hydrogen peroxide stoichiometrically sufficient to oxidize the transuranic values to the hexavalent state, and digesting the solution at room temperature.

15128

PROCESS OF PREPARING A FLUORIDE OF TETRAVLENT URANIUM. Earl J. Wheelwright (to U. S. Atomic Energy Commission). U. S. Patent 2,874,026. Feb. 17, 1959.

A method is described for producing a fluoride salt of tetravalent uranium suitable for bomb reduction to metallic uranium. An aqueous solution of uranyl nitrate is treated with acetic acid and a nitrite-suppressor and then contacted with metallic lead whereby uranium is reduced from the hexavalent to the tetravalent state and soluble lead acetate is formed. Sulfate ions are then added to the solution to precipitate and remove the lead values. Hydrofluoric acid and alkali metal ions are then added causing the formation of an alkali metal uranium double-fluoride in which the uranium is in the tetravalent state. After recovery, this precipitate is suitable for use in the bomb production of metallic uranium.

15129

PROCESS OF FORMING PLUTONIUM SALTS FROM PLUTONIUM OXALATES. C. S. Garner (to U. S. Atomic Energy Commission). U. S. Patent 2,875,025. Feb. 24, 1959.

A process is presented for converting plutonium oxalate to other plutonium compounds by a dry conversion method. According to the process, lower valence plutonium oxalate is heated in the presence of a vapor of a volatile non-oxygenated monobasic acid, such as HCl or HF. For example, in order to produce plutonium chloride, the pure plutonium oxalate is heated to about 700°C in a slow stream of hydrogen plus HCl. By the proper selection of an oxidizing or reducing atmosphere, the plutonium halide product can be obtained in either the plus 3 or plus 4 valence state.

15130

CENTRIFUGAL SEPARATORS. Charles Skarstrom (to U. S. Atomic Energy Commission). U. S. Patent 2,876,949. Mar. 10, 1959.

A centrifugal separator is described for separating gaseous mixtures where the temperature gradients both longitudinally and radially of the centrifuge may be controlled effectively to produce a maximum separation of the process gases flowing through. The invention provides for the balancing of increases and decreases in temperature in various zones of the centrifuge chamber as the result of compression and expansion, respectively, of process gases and may be employed effectively both to neutralize harmful temperature gradients and to utilize beneficial temperature gradients within the centrifuge.

15131

DEHYDRATION OF DEUTERIUM OXIDE SLURRIES. C. F. Hiskey (to U. S. Atomic Energy Commission). U. S. Patent 2,877,091. Mar. 10, 1959.

A method is presented for recovering heavy water from uranium oxide—heavy water slurries. The method consists in saturating such slurries with a potassium nitrate-sodium nitrate salt mixture and then allowing the self-heat of the slurry to raise its temperature to a point slightly in excess of 100°C, thus effecting complete evaporation of the free heavy water from the slurry. The temperature of the slurry is then allowed to reach 300 to 400°C causing fusion of the salt mixture and expulsion of the water of hydration. The uranium may be recovered from the fused salt mixture by treatment with water to leach the soluble salts away from the uranium-containing residue.

15132

ADSORPTION METHOD FOR SEPARATING METAL CATIONS. E. R. Tompkins and G. W. Parker (to U. S. Atomic Energy Commission). U. S. Patent 2,877,093. Mar. 10, 1959.

An improved method is presented for the chromatographic separation of fission products wherein a substantial reduction in liquid volume is obtained. The process consists in contacting a solution containing fission products with a body of ion-exchange adsorbent to effect adsorption of fission product cations. The loaded exchange resin is then contacted with a small volume of a carboxylic acid eluant, thereby recovering the fission products. The fission product carrying eluate is acidified without increasing its volume to the volume of the original solution, and the acidified eluate is then used as a feed solution for a smaller body of ion-exchange resin effecting readsorption of the fission product cations.

15133

ADSORPTION METHOD FOR SEPARATING METAL CATIONS. J. X. Khym (to U. S. Atomic Energy Commission). U. S. Patent 2,877,094. Mar. 10, 1959.

The chromatographic separation of fission product cations is discussed. By use of this method a mixture of metal cations containing Zr, Cb, Ce, Y, Ba, and Sr may be separated from one another. Mentioned as preferred exchange adsorbents are resins containing free sulfonic acid groups. Various eluants, such as tartaric acid, HCl, and citric acid, used at various acidities, are employed to effect the selective elution and separation of the various fission product cations.

15134

FORMATION OF URANIUM PRECIPITATES. John M. Googin, Jr. (to U. S. Atomic Energy Commission). U. S. Patent 2,878,100. Mar. 17, 1959.

A method is described for precipitation of uranium peroxide from uranium-containing solutions so as to obtain larger aggregates which facilitates washing, decantation, filtration, centrifugation, and the like. The desired larger aggregate form is obtained by maintaining the pH of the solution in the approximate range of 1 to 3 and the temperature at about 25°C or below while carrying out the precipitation. Then prior to removal of the precipitate a surface active sulfonated bicarboxyacid, such as di-octyl sodium sulfo-succinate, is incorporated in an amount of the order of 0.01 to 0.05 percent by weight, and the slurry is allowed to ripen for about one-half hour at a temperature below 10°C.

15135

PROCESS FOR PURIFYING CRUDE PERFLUOROCARBONS. R. E. Holeton (to U. S. Atomic Energy Commission). U. S. Patent 2,879,228. Mar. 24, 1959.

A method is described for refining organic perfluoro compounds. In the manufacture of perfluorinated compounds by the fluorination of hydrocarbons, the product frequently is contaminated by incompletely fluorinated hydrogen containing impurities. These impurities can be removed by contacting the product, in a fluid condition, with an active adsorbent, such as silica gel or alumina gel. The patent claims are restricted to the refining of crude perfluorinated lubricating oil.

15136

PRODUCTION OF URANIUM—CALCIUM FLUORIDE. W. B. Tolley (to U. S. Atomic Energy Commission). U. S. Patent 2,880,059. Mar. 31, 1959.

A method is described for the preparation of anhydrous $CaUF_6$ from an aqueous solution of uranyl nitrate. A water soluble calcium salt is added to the solution in the amount required to establish an equimolar ratio to the uranium is reduced to the tetravalent state by incorporation of a suitable reducing agent, such as stannous ion, and then hydrofluoric acid is added to precipitate $CaUF_6 \cdot 1H_2O$. The hydrated salt is removed and dehydrated by heating to a temperature in the range of 250 to 300°C in the absence of air. The anhydrous salt is essentially nonhygroscopic and is useful in the production of metallic uranium by the bomb reduction process using.

15137

NITRIC ACID RECOVERY FROM WASTE SOLUTIONS. A. S. Wilson (to U. S. Atomic Energy Commission). U. S. Patent 2,882,129. Apr. 14, 1959.

The recovery of nitric acid from aqueous nitrate solutions containing fission products as impurities is described. It is desirable to subject such solutions to concentration by evaporation since nitric acid is regenerated thereby. A difficulty, however, is that the highly radioactive fission product ruthenium is volatilized together with the nitric acid. It has been found that by adding nitrous acid, ruthenium volatilization is suppressed and reduced to a negligible degree so that the distillate obtained is practically free of ruthenium.

15138

ION EXCHANGE SUBSTANCES BY SAPONIFICATION OF ALLYL PHOSPHATE POLYMERS. J. Kennedy (to U. S. Atomic Energy Commission). U. S. Patent 2,882,248. Apr. 14, 1959.

An ion exchange resin having a relatively high adsorption capacity for uranyl ion as compared with many common cations is reported. The resin comprises an alphyl-allyl hydrogen phosphate polymer, the alphyl group being either allyl or a lower alkyl group having up to 5 carbon atoms. The resin is prepared by polymerizing compounds such as alkyl-diallyl phosphate and triallyl phosphate in the presence of a free radical generating substance and then partially hydrolyzing the resulting polymer to cause partial replacement of organic radicals by cations. A preferred free radical generating agent is dibenzoyl peroxide. The partial hydrolysis is brought about by refluxing the polymer with concentrated aqueous NaOH for three or four hours.

Radiation and Radiochemistry

15139 AD-205896

Ohio State Univ. Research Foundation, Columbus. THE CHARACTERIZATION OF PRODUCTS FROM IRRADIATED CARBOHYDRATES. Progress Report No. 3 [for] February 20, 1958 to April 19, 1958. M. L. Wolfrom. 13p. Project No. 7-84-01-002. Contract DA 19-129-QM-932.

G-values for irradiated sucrose, methyl α-D-glucopyranoside, and maltose are reported. Trehalose (aqueous) is hydrolyzed by cathode ray irradiation. The per cent hydrolysis of trehalose increases with increasing irradiation dosage. One reducing substance other than D-glucose was detected in the product of irradiated powdered crystalline D-glucose. (auth)

15140 AD-210341

General Mills, Inc., Minneapolis. A STUDY OF THE EFFECTS OF IONIZING RADIATION ON SUGARS. Progress Report No. 2 for September 1, 1957—November 30, 1957. J. S. Andrews. 14p. Project No. 7-84-01-002. Contract QMR&E (Natick) No. 78.

Experiments describing the influence of pH on the ultraviolet absorption spectra of irradiated glucose solutions have shown that the position of the absorption maximum and the intensity of absorption at the maximum are dependent on the pH of the solution. The position of the maximum is higher and the intensity is greater the more basic the solution. The effect of gamma radiation on the pH and the ultraviolet absorption spectra of sucrose solution is also reported. The performance of an ion current integrator for the accurate measurement of the currents from a small ionization chamber is described. The ionization chamber is being developed as a dose measuring device for gamma radiation from a cobalt-60 source. The cellophane-dye dosimeter has been used to measure the depth-dose characteristics of 2-Mev electrons in polyethylene. Using the cellophane dosimeter, source comparison studies have been carried out with a cobalt-60 source. (auth)

15141 IGR 109(O/W)
United Kingdom Atomic Energy Authority. Industrial Group. Windscale Works, Sellafield, Cumb., England.
ANALYTICAL METHOD FOR THE DETERMINATION OF ZIRCONIUM 95 IN PLUTONIUM PLANT SOLUTIONS. 12p.

After several purification steps, radiozirconium and carrier are extracted into TTA/benzene and eventually weighed as ZrO_2. The sample is counted and the γ-activity corrected for chemical yield. (auth)

15142 NRL-5239
Naval Research Lab., Washington, D. C.
RADIOCHEMICAL ANALYSES OF AIR-FILTER SAMPLES COLLECTED DURING 1957. R. A. Baus, R. L. Patterson, Jr., A. W. Saunders, Jr., and L. B. Lockhart, Jr. Oct. 17, 1958. 19p. Project NR-571-000. (AD-210052).

The results of sequential radiochemical analyses for some high-yield fission elements collected by air filters during 1957 at sites along the 80th meridian (west) and at several other sites in the Northern Hemisphere are reported. Particularly noteworthy is the large excess of the long-lived radioisotopes Sr^{90} and Cs^{137} at all locations, which leads to apparent ages of the fission debris that are considerably longer than the expected lifetime of this material in the lower atmosphere. The apparent age of the fission debris is much greater south of the Equator as would be expected if stratospheric mixing occurs. Further, the ratio of the Cs^{137} to Sr^{90} activity in the air is around 2 at all sites regardless of latitude or apparent age of the fission debris collected. (auth)

15143 ORO-192
Florida State Univ., Tallahassee.
RADIATION INDUCED EFFECTS IN HETEROGENEOUS ORGANIC SYSTEMS. Progress Report for Period February 15, 1958 to December 1, 1958. Russell H. Johnsen. Includes paper: SOME ASPECTS OF THE RADIATION CHEMISTRY OF ALIPHATIC CARBOXYLIC ACIDS. 30p. Contract AT(40-1)-2001. $4.80(ph), $2.70(mf) OTS.

The interaction of aliphatic hydrocarbons with metals under the influence of gamma radiation is described. The recoil-tritium labeling of a series of aliphatic acids from acetic to hexaic is reported. Nine carboxylic acids were irradiated to investigate the mechanism of gamma-ray induced decomposition of the acids. (W.L.H.)

15144 PDB-130
Atomic Energy of Canada Ltd. Chalk River Project, Chalk River, Ont.
EXTRACTION AND PURIFICATION OF CESIUM-137. L. C. Watson and R. J. Evans. Sept. 2, 1954. Changed from OFFICIAL USE ONLY Jan. 14, 1959. 34p. (AECL-714). $1.00(AECL).

Both tracer scale and high level activity experimental work were done to develop a process suitable for plant use in the final purification of cesium-137 obtained from the available fission product solutions. The process developed consists of application of alkaline (pH 13) solution to a Duolite C-3 resin column, elution of sodium with 0.25N HNO_3 and then elution of cesium with 1N HNO_3. Products have been obtained with cesium concentrations of 2 mc/ml and radiochemical purities of 99%. (auth)

15145 NP-7518
DISPROPORTIONATION OF AMERICIUM (V). A. A. Zaitsev, V. N. Kosyakov, A. G. Rykov, Yu. P. Sobolev, and G. N. Yakovlev. [nd]. 20p.

The disproportionation of americium(V) in hydrochloric, sulfuric, and nitric acids followed two reactions: 2 Am(V) = Am(VI) + Am(V), and Am(IV) + Am(V) = Am(VI) + Am(III); with parallel radiolytic reduction of VI, V, and IV. The rate constant for $2\ AmO_2^+ + 4H^+ = AmO_2^{2+} + Am^{4+} + 2H_2O$ in hydrochloric acid solutions is $(1.45 \pm 0.10) \times 10^{-2}$ l/mol/hr. For this reaction $\Delta E_{298} = 1.93 \pm 0.9$ kcal/mol; $\Delta H^*_{298} = 18.7 \pm 0.9$ kcal/mol; $\Delta S^*_{298} = 20.1 \pm 3.0$ kcal/deg./mol, and $\Delta F^*_{298} = 12.7 \pm 0.9$ kcal/mol. The rate constant of americium(V) disproportionation in sulfuric acid solutions is proportional to the hydrogen ion concentration and is 0.45 ± 0.03 l/mol/hr. In nitric acid solutions the relation of disproportionation reaction rate to the acid concentration is much more complex. (tr-auth)

15146 WADC-TN-59-12
Chicago. Univ.
RADIATION INDUCED REACTIONS OF OLEFINS. Priscilla C. Chang. Feb. 10, 1959. 27p. Project 7021. Contract AF33(616)-3875. (AD-209127).

Radiolysis products of simple olefins were studied with particular attention directed to the role played by free radicals in their radiation chemistry. Also, initiators such as gamma radiation, light, and preoxides are compared in free radical additions to terminal olefins. The addition of polyhalomethanes and mercaptans to olefins was selected for study. (J.R.D.)

15147 WAPD-CDA(AD)-520
[Westinghouse Electric Corp. Bettis Plant, Pittsburgh].
PILOT-PLANT EVALUATION OF COD(S.4) DECONTAMINATION SOLUTION. J. M. Lojek, A. Zirkes, and W. T. Lindsay, Jr. [1959]. 29p. $4.80(ph), $2.70(mf) OTS.

A feed-and-bleed decontamination procedure was employed, using an oxidizing-complexing solution to remove UO_2 from a loop which was purposely contaminated with irradiated, sintered UO_2. Two 12-hr runs were made, resulting in a removal of 93% of the total activity inserted for the first 12-hr run and 99% removal of the total activity inserted for the second 12-hr run. The average decontamination factors obtained on the basis of radiation survey measurements were 4.9 for the first 12-hr run and 38.7 for the second 12-hr run. The greater decontamination factor obtained in the second run was largely due to the fact that about seven times more activity was added to the loop than for the first run, with resulting higher initial radiation readings. Final radiation readings were more nearly the same. Decontamination factors usually are found to be dependent on the initial level of contamination: the higher the level, the greater the decontamination factor obtainable in a given time with a given treatment. With the exception of severe attack on Hastelloy D, types 410, 430, and AM 355 stainless steels, no deleterious corrosive effects were detected in loop components or corrosion specimens. (auth)

15148 CEA-tr-A-559
LA DISSIMULATION DE L'URANIUM(VI) DANS LES DOSAGES COMPLEXOMÉTRIQUES (pH 10). (Dissimulation of Uranium(VI) in Complexometric Determinations (pH 10). E. Lassner and R. Scharf. Translated into French by M. B. Moreau from Z. anal. Chem. 159, 212-14(1957). 5p.

Some examples of the complexometric determinations of magnesium and zinc with (ethylenediamine)tetraacetic acid and eriochrome black show the effectiveness of the concealment of uranium with hydrogen peroxide. (tr-auth)

15149

THE CHEMISTRY OF DIRECT AND INDIRECT RADIATION EFFECTS: AMINO ACIDS. K. Dose and B. Rajewsky (Max Planck Inst., Frankfurt am Main). Biochem. Z. 330, 131-40(1958).

The benzene, serum albumin, and γ-globulin were studied from −60 to 30°C. Decomposition products were easily produced in aqueous solutions of lysine at 20°C, less so in solid lysine, very little in an aqueous solution at −30°C, and none in aqueous lysine adsorbed onto an ion exchange resin. A similar protection by adsorption was observed for other amino acids, serum albumin, and γ-globulin and this protection was independent of the presence of H_2O.

15150

INACTIVATION OF SULFHYDRYL GROUPS OF TISSUE PROTEINS OF RATS EXPOSED TO RONTGEN RAYS. V. M. Rodionov, E. M. Kedrov, and G. I. Marchenko. Biokhimiya 23, 689-98(1958).

Irradiation elicited a reduction in the number of SH groups in the liver and spleen proteins of the irradiated animal. Inactivation of slowly reacting SH groups which appeared only during irradiation or shortly thereafter, and directly related to the action of the ionizing rays, was prevented by protective doses of cysteine administered prior to irradiation. Inactivation of free SH groups of tissue proteins occurred not only during or shortly after irradiation but during several days following.

15151

MODIFICATION OF THE CHEMICAL BEHAVIOR OF RED PHOSPHORUS BY IRRADIATION IN A NUCLEAR REACTOR. Pierre Süe and Jean Merinis (Collège de France, Paris). Bull. soc. chim. France No. 5, 735-8 (1959) May. (In French)

Red phosphorus, irradiated with reactor neutrons, is more easily oxidized by the oxygen of the air than the inactive phosphorus. By aqueous extraction in the presence of air, a soluble fraction representing 1 to 1.5% of the total mass can be separated from the irradiated phosphorus. This fraction has a specific activity twice that of the insoluble phosphorus. The same experiments were made in the absence of air. Only a very small mass of the phosphorus was found in solution. By two-dimensional paper chromatography of the aqueous extracts, the different oxygen compounds of the phosphorus were separated, and their mass and activities were determined. (tr-auth)

15152

HIGH-TEMPERATURE PROCESSING OF MOLTEN FLUORIDE NUCLEAR REACTOR FUELS. Warren R. Grimes, James H. Shaffer, Newman V. Smith, Richard A. Strehlow, Wilfred T. Ward, and George M. Watson (Oak Ridge National Lab., Tenn.). Chem. Eng. Progr. 55, Symposium Ser. No. 27, 65-70(1959).

The removal of certain undesirable fission-product fluorides from reactor fuels consisting of molten mixtures of uranium tetrafluoride with other fluorides has been successfully accomplished in small-scale experiments by precipitation techniques which may be adaptable to large-scale application. Data relating to the solubility of xenon and other rare gases are presented and are pertinent to the ease of removal of such gaseous fission-product poisons. The rare earth trifluorides crystallize from NaF-ZrF_4-UF_4 or LiF-BeF_2-UF_4 fuel mixtures as the simple, uncomplexed trifluoride. Solutions containing more than one rare earth fluoride yield as the primary phase a solid solution of the trifluorides. Absolute solubilities in the range of 450° to 550°C are relatively low. Accordingly by use of equilibria such as $SmF_{3(d)} + CeF_{3(s)} \rightleftharpoons CeF_3 \cdot SmF_{3(ss)} + CeF_{3(d)}$(where d, s, and ss refer to dissolved, solid, and solid solution, respectively) it is possible to deplete the liquid of nuclearly harmful rare earth species. The fuel mixture is, in the process, essentially saturated with cerium trifluoride at the temperature of separation. Selective precipitation of polyvalent cations from fluoride melts by addition of oxides has been successful in laboratory-scale experiments. Chromatographic separation of cations of various valences by precipitation on oxide beds has shown promise in preliminary experiments. (auth)

15153

POST-EFFECT IN THE TREATMENT OF METHYLMETACRYLATE WITH IONIZING RADIATIONS IN THE PRESENCE OF OXYGEN. B. L. Tsetlin, V. A. Sergeev, S. R. Rafikov, V. V. Korshak, P. Ya. Glazunov, and L. D. Bubis (Inst. of Physical Chemistry, Academy of Sciences, U.S.S.R.). Doklady Akad. Nauk S.S.S.R. 126, 123-5(1959) May 1. (In Russian)

The kinetics of methylmethacrylate polymerization was studied in relation to the conditions of the preliminary irradiation and the temperature of polymerization. (R.V.J.)

15154

THE MECHANISM OF THE RADIATION DECOMPOSITION OF HYDROGEN PEROXIDE. B. V. Ershler, M. A. Nezhevenko, and G. G. Myasishcheva (Inst. of Theoretical and Experimental Physics, Academy of Sciences, U.S.S.R.). Doklady Akad. Nauk S.S.S.R. 126, 126-9 (1959) May 1. (In Russian)

Comparisons were made of the $G_{H_2O_2}$ yield with the previously presented data on the γ radiolysis of water expressed by the equation $(2k + 1) H_2O = (2m + n) H_2O = nH + mOH + lH_2O_2 + kH_2$, where $n = 3.64$, $m = 2.86$, $l = 0.87$, and $k = 0.48$ are the coefficients representing the number of corresponding particles. An attempt was made to show that the comparison reveals the mechanism of the H_2O_2 decomposition process. The reactions $H_2O_2 + H \rightarrow H_2O + OH$, $H_2O_2 + OH \rightarrow H_2O + HO_2$, $HO_2 + H \rightarrow H_2O_2$, $HO_2 + OH \rightarrow H_2O + O_2$, $H_2O_2 + HO_2 \rightarrow H_2O + OH + O_2$, $HO_2 + HO_2 \rightarrow H_2O_2 + O_2$, and $H_2O_2 + 2HO_2 \rightarrow 2H_2O_2 + O_2$ were postulated. The mechanisms of the radiation decomposition of peroxide are shown. The described analysis can be applied to various radiolytic processes. (R.V.J.)

15155

THE ROLE OF THORIA IN NUCLEAR ENERGY. D. J. O'Connor (Atomic Energy Research Establishment, Harwell, Berks, Eng.). Énergie nucléaire 1, 5-12(1959) Jan.–Apr. (In French)

The principal properties of thoria are reviewed, and the physical, thermodynamic, and nuclear properties are tabulated. The use of thoria as a ceramic in two typical thermal reactors—the aqueous homogeneous reactor and the high-temperature, gas-cooled reactor—is considered with respect to the $Th-U^{238}$ cycle. 51 references. (J.S.R.)

15156

CHEMICAL TREATMENT AND HANDLING OF RADIOELEMENTS. H. Laurent (Centre d'Études Nucléaires, Saclay, France). Énergie nucléaire 1, 13-22(1959) Jan.—Apr. (In French)

Although many classical chemical techniques are used in radiochemistry, the energies used in the formation of radioisotopes, the low concentration of the isotopes formed, and the secondary effects of the radiation on the solutions and solid bodies require the development of new techniques. The more common methods for the formation and preparation of radioisotopes are reviewed. The dangers to the operator from external radiation and external and internal contamination are considered. The precautions and techniques utilized to minimize these dangers are considered. 64 references. (J.S.R.)

15157

THE CHEMICAL PROBLEMS OF THE NUCLEAR INDUSTRY. Robert Sartorius (Commissariat à l'Énergie Atomique, Paris). p.9-18 of "Journées d'Information sur l'Énergie Nucléaire, 14-15-16 Janvier 1957." Documents, Suppl. to No. 114. France, Commissariat General á la Productivité. 1957. 203p. (In French)

Chemistry must furnish to the nuclear industry its primary materials and it must process the irradiated fuel elements. The constituents of a reactor are listed and the chemical processing required for each is summarized. The new techniques developed include solvent extraction and ion exchange. The special characteristics of a plant treating radioactive materials are briefly described. (J.S.R.)

15158

PREPARATION OF CARRIER-FREE LEAD-212 (THORIUM B). E. M. Morimoto and Milton Kahn (Univ. of New Mexico, Albuquerque). J. Chem. Educ. 36, 296 (1959) June.

The 10.6-hr Pb^{212} can be separated in carrier-free form by placing Th(OH)$_4$ or other suitable compound in an electric field. Thoron (Rn^{220}) escapes into the gas phase, decays to Po^{216}, which decays to positively charged ions of Pb^{212}. These ions collect on the negative plate. A simple apparatus for this purpose is described. (T.R.H.)

15159

EFFECTS OF THE RADIATION INTENSITY ON THE KINETICS OF RADIOCHEMICAL POLYMERIZATIONS IN SOLUTION. Adolphe Chapiro, Pierre Cordier, Vincent K. Hayashi, Itaru Mita, and Jeanne Seban-Danon (Faculté des Sciences, Paris). J. chim. phys. 56, 447-54(1959) May. (In French)

The kinetics of the radiochemical polymerization of styrene in solution in toluene (I), and carbon tetrachloride (II) and of methyl methacrylate in methyl acetate (III), carbon tetrachloride (IV), and benzene (V) were studied in a wide range of gamma intensities. The systems (I) and (IV) present a "normal" kinetic behavior, that is, the deviation from classical law of $I^{1/2}$ at high intensities, which is caused by the competition reactions for the primary free radicals, is produced by smaller intensities when the solution is more dilute. On the contrary, the other systems have an "abnormal" kinetic behavior. These observations are interpreted by admitting that the reactivities of the free radicals formed by irradiation of the solvent and of the monomer can be very different, which can lead to different interaction probabilities between the radicals or with the monomer. The results obtained are discussed. (tr-auth)

15160

EFFECTS OF NUCLEAR TRANSFORMATIONS ON THE BROMATES. THE DECOMPOSITION OF THE BROMATE ION UNDER THE EFFECT OF AN ISOMERIC TRANSITION. I. G. Campbell (Institut de Recherches Nucléaires, Warsaw). J. chim. phys. 56, 480-5(1959) May. (In French)

The chemical effects of an isomeric transition on bromate ions in solution were studied. Some indications were found of the formation of an instable "bromite" fragment produced in aqueous solution and which can be reduced to a lower valence by methanol and eventually oxidized to the bromate state by oxidants. The neutralization of the charge of the 18-min. Br^{80} to lower valences can not lead to the formation of bromate, and the formation of the stable bond Br—O during the discharge of the "bromite" fragment appears theoretically improbable. The "bromite" fragments are not hydrated at high pH. The effects of an isomeric transition on the bromate ion are comparable to the effects of the (n,γ) reactions on the oxy anions. (tr-auth)

15161

DISSOCIATION OF TH AND T$_2$ BY β-DECAY. S. Wexler (Argonne National Lab., Lemont, Ill.). J. Inorg. & Nuclear Chem. 10, 8-16(1959) Apr.

The positively charged fragments resulting from β-decay in the diatomic molecules TH and T$_2$ were analyzed by the techniques of mass spectrometry. The data on tritium hydride support the findings of Snell et al. that the (HHe^3)$^+$ daughter usually remains bound in the nuclear transformations. The stability against dissociation of the ionized daughter molecules [(HHe^3)$^+$ and (THe^3)$^+$] was observed to depend slightly on the mass of the bonding partner. The results are discussed within the framework of the Franck-Condon principle. (auth)

15162

THE CHEMISTRY OF PROTACTINIUM-IV. SOME SPECTROPHOTOMETRIC OBSERVATIONS. A. T. Casey and A. G. Maddock (University Chemical Lab., Cambridge, Eng.). J. Inorg. & Nuclear Chem. 10, 58-68(1959) Apr.

True solutions of protactinium in hydrochloric acid, above 4 N in acid, are free from absorption bands down to at least 300 mμ. At lower wavelengths a band appears with its maximum below 210 mμ. The onset of hydrolysis and disappearance of the solvent extractability of the protactinium from the solution coincides with the appearance of an absorption band with its maximum at 260 mμ. Protactinium gives color reactions with pyrogallol, cathechol, gallic and tannic acids as well as quinalizarin and 8-hydroxyquinoline. The absorption spectra of the first three complexes show maxima at 355, 323, and 343 mp. respectively; the molar extinction coefficients for the three complexes are 2.6 • 10^4, 4.8 • 10^3, and 5.3 • 10^3. The pyrogallol complex seems suitable for the chlorination estimation of protactinium. (auth)

15163

THE APPLICABILITY OF DISCOLORATION PHENOMENA IN HIGH POLYMERS TO DOSIMETRIC PURPOSES. Walter Goebel (Technische Hochschule, Munich). Nukleonik 1, 227-33(1959) June. (In German)

With the aim of developing a technically usable method for radiation dosage determination in the range of several megarӧntgens, the radiation-induced changes in the optical and ultraviolet absorption of ten kinds of plastic films were measured. In two films a diacetate and a triacetate film, the additional changes after the end of the radiation were so low that these films appear suitable as dosimeters. The wave length used for evaluation was 2800 A. The deviations are less than 10%. For comparison, the usual methods are briefly discussed. (tr-auth)

15164

ON THE AVERAGE ENERGIES OF MOLECULAR IONS. D. P. Stevenson (Shell Development Co., Emeryville, Calif.). Radiation Research 10, 610-21(1959) June.

The average excitation energy $\bar{e}$ with which molecule ions are formed by electron impact-induced ionization in relation to the average energy expended in the formation of molecule ions is considered. Under the assumption of an essential applicability of a quasi-equilibrium rate theory to mass spectra, $\bar{e}$ can be related to two observable mass spectral qualities. The validity of the quasi-equilibrium theory is also independently checked by using the data to calculate an average energy required to form a molecule ion by methods which are not dependent on the theory. Comparison of the average excitation energies with which ions are formed as calculated from the equations indicate excellent agreement between the different methods. (J.R.D.)

15165

THE CLUSTERING OF IONS IN IRRADIATED GASES. John L. Magee and Koichi Funabashi (Univ. of Notre Dame, Ind.). Radiation Research 10, 622-35(1959) June.

The general theory of the clustering of ions in irradiated gases is considered. A systematic comparison of theory with experiment is impossible due to lack of data, however a limited comparison is made, and a brief consideration of the effects of clustering on the radiation chemistry of gases is given. (J.R.D.)

15166

DECOMPOSITION OF n-BUTANE IN AN ELECTRIC DISCHARGE. Aron Kuppermann and Milton Burton (Univ. of Notre Dame, Ind.). Radiation Research 10, 636-54(1959) June.

The current scientific views are that the chemical effects of a discharge on molecules is an electronic excitation of neutral free radicals. Ionic reactions are unimportant, and the kinetic temperature of the molecules is not high. These views are extended to an examination of n-butane, i-butane, argon and deuterium. Experimental procedure and results are discussed and it is concluded that the present views are substantiated. In addition it was concluded that results are consistent with a mechanism of energy input involving energy transfer from the electrons in the discharge to radicals via excitations of low-lying electronic states of these radicals. (J.R.D.)

15167

RADIATION-INDUCED REACTIONS IN THE $N_2-O_2-H_2O$ SYSTEM. A. Russell Jones (Oak Ridge National Lab., Tenn.). Radiation Research 10, 655-63(1959) June.

The exposure of moist nitrogen-oxygen mixtures to electron bombardment was shown to lead directly to the formation of nitric acid and nitrous oxide. After complete exhaustion of the water, the nitric acid disappeared with the formation of water and a stoichiometric amount of nitrogen dioxide. Subsequent to the decomposition of the nitric acid, nitrogen dioxide was produced at a much lower rate, and the total nitrogen fixation yield was decreased. The production and destruction of nitric acid were linear functions of the energy input, as was the formation of nitrogen dioxide from the nitric acid. There was a marked dependence of the G values for all these chemical changes on the oxygen concentration, with maximum values reached in every case at about 15 mole % oxygen. (auth)

15168

THE EXCHANGE OF HYDROGEN AND DEUTERIUM IN THE PRESENCE OF ELECTRONS AND ULTRAVIOLET RADIATION. O. A. Schaeffer and S. O. Thompson (Brookhaven National Lab., Upton, N. Y.). Radiation Research 10, 671-9(1959) June.

The mechanism for the radiation-induced exchange of hydrogen and deuterium in the presence of the rare gases is studied from considerations of the individual ion molecule reaction rate constants and energy changes. A mechanism is proposed which accounts adequately for the experimental facts. The reaction is studied in the simultaneous presence of ultraviolet and electron radiations. It is shown that there is an interaction between the ion and radical reactions and that the increased presence of hydrogen atoms inhibits the ion reaction. It is suggested that the reaction may terminate by the neutralization of ion molecule clusters with free electrons. (auth)

15169

THE RADIATION CHEMISTRY OF ACETYLENE. I. RARE GAS SENSITIZATION. II. WALL EFFECT IN BENZENE FORMATION. Leon M. Dorfman and A. C. Wahl (Argonne National Lab., Lemont, Ill.). Radiation Research 10, 680-90(1959) June.

In the rare gas-sensitized radiolysis of acetylene, with helium, argon, krypton, and xenon, cyclization to benzene is completely eliminated. In the direct radiolysis the fraction of reacted acetylene going to benzene, which is constant at 0.2 at high pressures, is found to decrease sharply at very low pressures. This is shown to be due to a wall effect. From a consideration of the experimental conditions it is shown that benzene precursors reaching the wall have a lifetime of at least 10^{-4} sec. These new observations, together with the earlier kinetic studies, are consistent with a mechanism involving a complete duality of primary process in which the precursors of the polymer and of benzene are distinct. It is suggested that ionization of the acetylene leads to polymerization, whereas cyclization requires electronic excitation of the acetylene, probably to a triplet state. (auth)

15170

THE DIRECT RADIOLYSIS AND THE RADIATION-SENSITIZED HYDROGENATION OF ETHYLENE. F. W. Lampe (Humble Oil and Refining Co., Baytown, Tex.). Radiation Research 10, 691-701(1959) June.

In the electron radiolysis of pure ethylene, some dozen gaseous products, increasing in mass up to n-hexane, are formed. The major products are acetylene, hydrogen, n-butane, and ethane. The G values for formation of the gaseous products and for disappearance of the ethylene are independent of pressure. Polymerization of ethylene to nonvolatile material appears to be the predominant reaction, however, since the gaseous products account for only about one-third of the ethylene reacted. When argon is added to ethylene, an energy transfer occurs which accelerates the reaction but does not cause any large change in the course of the reaction. This is interpreted as suggestive of ethylene ion formation as a result of energy transfer. The irradiation of argon-hydrogen-ethylene mixtures shows that specific radiation-sensitized hydrogen atom initiation is feasible. This is due to the rapid reaction of argon ions with hydrogen molecules that was first observed in mass spectrometers. (auth)

15171

SOME RADIOMETRIC METHODS FOR THE DETERMINATION OF URANIUM AND THORIUM IN MINERALS. Daniele Prosperi (Comitato Nazionale ricerche nucleari, Milan) and Sebastiano Sciuti (Istituto nazionale di fisica nucleare, Rome). Ricerca sci. 28, 345-61 (1958) Feb. (In Italian)

The principle radiometric methods for the analysis of uranium and thorium minerals are discussed critically. A new method for the determination of the uranium and thorium percentages is proposed and discussed. The method is applicable even when the activity of the two series are comparable and when the uranium series is not in equilibrium. The method is based on the simultaneous measurement of the beta and gamma activity of the sample, and two measurements of the gamma activity are made at two energy levels. With this method uranium contents of 0.05% can be determined with an error of 5%. The apparatus can be used for the analysis of minerals with uranium concentrations above 0.020% and can distinguish between the two series when U/Th ≥ 0.03 even if the uranium series is not in equilibrium. (tr-auth)

15172

SEPARATION OF BARIUM VALUES FROM URANYL NITRATE SOLUTIONS. Edward R. Tompkins (to U. S. Atomic Energy Commission). U. S. Patent 2,875,024. Feb. 24, 1959.

The separation of radioactive barium values from a uranyl nitrate solution of neutron-irradiated uranium is described. The 10 to 20% uranyl nitrate solution is passed through a first column of a cation exchange resin under conditions favoring the adsorption of barium and certain other cations. The loaded resin is first washed with dilute sulfuric acid to remove a portion of the other cations, and then wash with a citric acid solution at pH of 5 to 7 to recover the barium along with a lesser amount of the other cations. The pH of the resulting eluate is adjusted to about 2.3 to 3.5 and diluted prior to passing through a smaller second column of exchange resin. The loaded resin is first washed with a citric acid solution at a pH of 3 to elute undesired cations and then with citric acid solution at a pH of 6 to elute the barium, which is substantially free of undesired cations.

15173

METHOD AND COATING COMPOSITION FOR PROTECTING AND DECONTAMINATING SURFACES. D. C. Overhold and M. D. Peterson (to U. S. Atomic Energy Commission). U. S. Patent 2,877,131. Mar. 10, 1959.

A protective coating useful in the decontamination of surfaces exposed to radioactive substances is presented. This coating is placed on the surface before use and is soluble in water, allowing its easy removal in the event decontamination becomes necessary. Suitable coating compositions may be prepared by mixing a water soluble carbohydrate such as sucrose or dextrin, together with a hygroscopic agent such as calcium chloride or zinc chloride.

Separation Processes for Pu and U

15174 CF-59-3-94(Rev.)(Del.)

Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho and Oak Ridge National Lab., Tenn. EUROCHEMIC ASSISTANCE PROGRAM: COMMENTS BY ICPP, DATED FEBRUARY 25, 1959, ON QUESTIONS LISTED IN ORNL-CF-59-1-75. M. E. Weech. Mar. 26, 1959. 7p. Contract [W-7405-eng-26]. $1.80(ph), $1.80(mf) OTS.

Information related to the performance and operation of the Idaho Chemical Processing Plant is presented. The information is presented as answers to questions posed for Eurochemic assistance program. (J.R.D.)

15175 CISE-66

Centro Informazioni Studi Esperienze, Milan. STUDI SUGLI IMPIANTI A DIFFUSIONE GASOSA PER L'ARRICCHIMENTO DELL' U^{235}. (A Study of the Gaseous Diffusion Plant for U^{235} Enrichment.) G. Perona. Apr. 1959. 63p.

The gaseous diffusion process for the enrichment of U^{235} is discussed. The physical principles of the process, the cascade, and selection of the pressures, temperatures, and barriers are described. The gaseous diffusion plant is discussed with a consideration of the preliminary calculation of the plant yield, the diffusor, operating temperature, layout of the plant, control, and cost analysis. The chemical properties of UF_6, its preparation and purification, and the transformation of UF_6 to UF_4 are reviewed. (J.S.R.)

15176 DP-313

Du Pont de Nemours (E. I.) & Co. Savannah River Lab., Aiken, S. C. DISSOLVER FOR NATURAL URANIUM FUEL ELEMENTS. Vincent P. Caracciolo. Dec. 1958. 23p. Contract AT(07-2)-1. $0.75(OTS).

Sufficient data were obtained with a semiworks-scale dissolver to permit design of plant-scale equipment for the dejacketing and subsequent dissolving of aluminum-clad uranium fuel elements of various shapes and sizes. The aluminum dejacketing reaction occurred as fast as caustic was added and was independent of the shape of the elements. The rate of uranium dissolving increased with increasing acidity, was proportional to the exposed surface area, and was independent of the shape of the elements. A mechanism for uranium dissolution is discussed that explains the variation of acid consumption and the rate of gas evolution. (auth)

15177 DP-336

Du Pont de Nemours (E. I.) & Co. Savannah River Lab., Aiken, S. C. DETECTION OF NITRITE ION IN PLUTONIUM NITRATE SOLUTIONS. Myron O. Fulda. Dec. 1958. 7p. Contract AT(07-2)-1. $0.50(OTS).

Colorimetric and potentiometric methods were developed for the very rapid detection of nitrite ion in the 2AF Purex process stream. Both methods were designed to detect the presence of excess nitrite in the valence adjustment step. The presence of nitrite was detected at a concentration as low as 2×10^{-4} molar. (auth)

15178 JENER-59

Joint Establishment for Nuclear Research, Kjeller, Norway. REPROCESSING ANALYSIS. M. Bonnevie-Svendsen. Apr. 1959. 63p.

A plan for analytical control of the JENER reprocessing plant is presented. Methods and possibilities of associated chemical determinations are discussed as well as the organization of the analytical work. A manual of methods used at JENER is included as well as a tabulation of the concentrations, activities, aliquots, shielding, number of determinations, and calculated time for the various sampling points. Also, four different time schedules for the analytical work are suggested. (J.R.D.)

15179 NAA-SR-3590
Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.
DECONTAMINATION OF THORIUM–URANIUM ALLOYS BY CONSUMABLE ARC-MELTING. R. E. Johnson and E. W. Murbach. June 15, 1959. 15p. Contract AT-11-1-GEN-8. $0.50 (OTS).

A study of the decontamination of thorium–uranium alloy by the consumable-electrode arc-melting process was carried out. Cesium and strontium removals of up to 75% were obtained, whereas cerium and rare earth removals were less than 20%. Metal loss increases with increasing power to the arc. The method is not suitable for a decontamination process but could be utilized as a step in a low-decontamination, reprocessing method. (auth)

15180
A PROBLEM OF THE WHOLE CHEMICAL INDUSTRY: THE TREATMENT OF URANIUM ORES. Leger. p.133-41 of "Journées d'Information sur l'Énergie Nucléaire, 14-15-16 Janvier 1957." Documents, Suppl. to No. 114. France, Commissariat General á la Productivité. 1957. 203p. (In French)

The processing of uranium ores is primarily a chemical problem, and a brief survey is given of the processes and the phases in the treatment of uranium ores. The chemical structure and characteristics of ores are discussed, with emphasis on the French ores. The concentration of the uranium was first done by the uranyl phosphate method, but the ion exchange process is more generally used now. This process is described. The criteria for the optimum yield of processing are reviewed. The solvent process for uranium recovery is briefly discussed as a possible future process. (J.S.R.)

15181
THERMONUCLEAR PROCESSES. D. W. Fry (Atomic Energy Research Establishment, Harwell, Berks, Eng.). J. Brit. Nuclear Energy Conf. 4, 145-56(1959) Apr.

An outline of the main approaches to controlled thermonuclear fusion as presented at the second Geneva conference is given. Topics discussed include: fundamental ideas and problems, closed line containment systems, open line containment systems, homopolar, and Ixion devices. (T.R.H.)

15182
ISOLATION OF NEPTUNIUM AS A MONO OCTYL PHOSPHORIC ACID COMPLEX BY LIQUID–LIQUID EXTRACTION. D. F. Peppard, G. W. Mason, and R. J. Sironen (Argonne National Lab., Lemont, Ill.). J. Inorg. & Nuclear Chem. 10, 117-27(1959) Apr.

The extraction of certain M(III), M(IV), and M(VI) actinides and lanthanides and Y(III) in the system mono(2-ethylhexyl) orthophosphoric acid (symbolized as H_2MEHP) in toluene diluent vs. aqueous HCl was investigated with respect to operational solvent and acid dependencies, state of oxidation, and Z, using the radioactive tracer technique. Through proper combination of solvent concentration and HCl concentration, systems may be devised by means of which M(IV) may be separated from M(VI) and M(III), or M(VI) may be separated from M(III). The ratio of the K values for Np(IV) and Np(VI) respectively exceeds 10^5 as does the ratio of the respective K values for U(IV) and U(VI). The ratio of the K value of Np(IV) to the K values of U(VI) and Pu(III) may be made greater than 10^4. A flow sheet for the isolation of Np as Np(IV) was devised and tested. This procedure requires only a single extraction with H_2MEHP (in toluene) followed by multiple scrubbing with 12 F HCl containing hydroquinone, or 6 F HCl containing hydroquinone and hydriodic acid, the reducing agents serving to reduce plutonium to Pu(III). The mechanism of extraction was examined tentatively in terms of ion exchange analogy and chloride complexing. The anti-synergistic interaction of TBP (tri-n-butyl phosphate) with H_2MEHP was utilized in effecting the return of Np(IV) to an aqueous phase. (auth)

15183
IMPROVEMENTS IN AND RELATING TO THE EXTRACTION OF URANIUM. (to Commonwealth Scientific and Industrial Research Organization). British Patent 813,269. May 13, 1959.

A semi-fluidized resin column is described for U extraction from ore leach solutions. Resin is put in at the top, fluidized and loaded by desanded leach pulp which enters at the bottom, and removed at the bottom. The loaded resin thus removed is passed through an elution unit. The column is pulsed to pump resin and leach pulp in and out; another pulser of higher frequency fluidizes the contents of the column. (T.R.H.)

15184
METHOD OF SEPARATING URANIUM VALUES, PLUTONIUM VALUES AND FISSION PRODUCTS BY CHLORINATION. H. S. Brown and G. T. Seaborg (to U. S. Atomic Energy Commission). U. S. Patent 2,875,021. Feb. 24, 1959.

The separation of plutonium and uranium from each other and from other substances is described. In general, the method comprises the steps of contacting the uranium with chlorine in the presence of a holdback material selected from the group consisting of lanthanum oxide and thorium oxide to form a uranium chloride higher than uranium tetrachloride, and thereafter heating the uranium chloride thus formed to a temperature at which the uranium chloride is volatilized off but below the volatilization temperature of plutonium chloride.

15185
METHOD OF FORMING PLUTONIUM-BEARING CARRIER PRECIPITATES AND WASHING SAME. B. F. Faris (to U. S. Atomic Energy Commission). U. S. Patent 2,875,022. Feb. 24, 1959.

An improvement of the lanthanum fluoride carrier precipitation process for the recovery of plutonium is presented. In this process the plutonium is first segregated in the LaF_3 precipitate and this precipitate is later dissolved and the plutonium reprecipitated as the peroxide. It has been found that the loss of plutonium by its remaining in the supernatant liquid associated with the peroxide precipitate is greatly reduced if, before dissolution, the LaF_3 precipitate is subjected to a novel washing step which constitutes the improvement of this patent. The step consists in intimately contacting the LaF_3 precipitate with a 4 to 10 percent solution of sodium hydrogen sulfate at a temperature between 10 and 95°C for ½ to 3 hours.

15186

PRECIPITATION METHOD OF SEPARATING PLUTONIUM FROM CONTAMINATING ELEMENTS. R. B. Duffield (to U. S. Atomic Energy Commission). U. S. Patent 2,875,026. Feb. 24, 1959.

A method is described for separating plutonium, in a valence state of less than five, from an aqueous solution in which it is dissolved. The method consists in adding potassium and sulfate ions to such a solution while maintaining the solution at a pH of less than 7.1, and isolating the precipitate of potassium plutonium sulfate thus formed.

15187

URANIUM SEPARATION PROCESS. William H. McVey and William H. Reas (to U. S. Atomic Energy Commission). U. S. Patent 2,877,087. Mar. 10, 1959.

The separation of uranium from an aqueous solution containing a water soluble uranyl salt is described. The process involves adding an alkali thiocyanate to the aqueous solution, contacting the resulting solution with methyl isobutyl ketone and separating the resulting aqueous and organic phase. The uranium is extracted in the organic phase as $UO_2(SCN)_2$.

15188

ELUTION OF URANIUM FROM RESIN. Daniel C. McLean (to U. S. Atomic Energy Commission). U. S. Patent 2,877,089. Mar. 10, 1959.

A method is described for eluting uranium from anion exchange resins so as to decrease vanadium and iron contamination and permit recycle of the major portion of the eluate after recovery of the uranium. Diminution of vanadium and iron contamination of the major portion of the uranium is accomplished by treating the anion exchange resin, which is saturated with uranium complex by adsorption from a sulfuric acid leach liquor from an ore bearing uranium, vanadium and iron, with one column volume of eluant prepared by passing chlorine into ammonium hydroxide until the chloride content is about 1 $\underline{N}$ and the pH is about 1. The resin is then eluted with 8 to 9 column volumes of 0.9 $\underline{N}$ ammonium chloride—0.1 $\underline{N}$ hydrochloric acid solution. The eluants are collected separately and treated with ammonia to precipitate ammonium diuranate which is filtered therefrom. The uranium salt from the first eluant is contaminated with the major portion of the vanadium and iron and is reworked, while the uranium recovered from the second eluant is relatively free of the undesirable vanadium and irons. The filtrate from the first eluant portion is discarded. The filtrate from the second eluant portion may be recycled after adding hydrochloric acid to increase the chloride ion concentration and adjust the pH to about 1.

15189

PROCESS USING BISMUTH PHOSPHATE AS A CARRIER PRECIPITATE FOR FISSION PRODUCTS AND PLUTONIUM VALUES. T. G. Finzel (to U. S. Atomic Energy Commission). U. S. Patent 2,877,090. Mar. 10, 1959.

A process is described for separating plutonium from fission products carried therewith when plutonium in the reduced oxidation state is removed from a nitric acid solution of irradiated uranium by means of bismuth phosphate as a carrier precipitate. The bismuth phosphate carrier precipitate is dissolved by treatment with nitric acid and the plutonium therein is oxidized to the hexavalent oxidation state by means of potassium dichromate. Separation of the plutonium from the fission products is accomplished by again precipitating bismuth phosphate and removing the precipitate which now carries the fission products and a small percentage of the plutonium present. The amount of plutonium carried in this last step may be minimized by addition of sodium fluoride, so as to make the solution 0.03N in NaF, prior to the oxidation and precipitation step.

15190

COORDINATION COMPOUND-SOLVENT EXTRACTION PROCESS FOR URANIUM RECOVERY. W. H. Reas (to U. S. Atomic Energy Commission). U. S. Patent 2,877,092. Mar. 10, 1959.

A method is presented for the separation of uranium from aqueous solutions containing a uranyl salt and thorium. The separation is effected by adding to such solutions an organic complexing agent, and then contacting the solution with an organic solvent in which the organic complexing agent is soluble. By use of the proper complexing agent in the proper concentration, uranium will be complexed and subsequently removed in the organic solvent phase, while the thorium remains in the aqueous phase. Mentioned as suitable organic complexing agents are antipyrine, bromoantipyrine, and pyramidon.

15191

PROCESS FOR SEPARATING URANIUM FISSION PRODUCTS. F. H. Spedding, T. A. Butler, and I. B. Johns (to U. S. Atomic Energy Commission). U. S. Patent 2,877,109. Mar. 10, 1959.

The removal of fission products such as strontium, barium, cesium, rubidium, or iodine from neutron-irradiated uranium is described. Uranium halide or elemental halogen is added to melted irradiated uranium to convert the fission products to either more volatile compositions which vaporize from the melt or to higher melting point compositions which separate as solids.

15192

RECOVERY OF URANIUM VALUES. Keith B. Brown, D. J. Crouse, Jr., and J. G. Moore (to U. S. Atomic Energy Commission). U. S. Patent 2,877,250. Mar. 10, 1959.

A liquid-liquid extraction method is presented for recovering uranium values from an aqueous acidic solution by means of certain high molecular weight amine in the amine classes of primary, secondary, heterocyclic secondary, tertiary, or heterocyclic tertiary. The uranium bearing aqueous acidic solution is contacted with the selected amine dissolved in a nonpolar water-immiscible organic solvent such as kerosene. The uranium which is substantially completely extracted by the organic phase may be stripped therefrom by water, and recovered from the aqueous phase by treatment into ammonia to precipitate ammonium diuranate.

15193

PROCESS FOR RECOVERING URANIUM. G. E. MacWood, Coleman D. Wilder, and D. Altman (to U. S. Atomic Energy Commission). U. S. Patent 2,879,130. Mar. 24, 1959.

A process is described for recovering uranium from deposits on stainless steel liner surfaces of calutrons.

The deposit is removed from the stainless steel surface by washing with aqueous nitric acid. The solution obtained containing uranium, chromium, nickel, copper, and iron is treated with excess of ammonium hydroxide to precipitate the uranium, iron, and chromium and convert the nickel and copper to soluble ammonia complexions. The precipitated material is removed, dried, and treated with carbon tetrachloride at an elevated temperature of about 500 to 600°C to form a vapor mixture of UCl_4, UCl_5, $FeCl_3$, and $CrCl_4$. The UCl_4 is separated from this vapor mixture by selective fractional condensation at a temperature of about 300 to 400°C.

15194

PROCESS FOR THE RECOVERY OF URANIUM FROM PHOSPHATIC ORE. R. L. Long (to U. S. Atomic Energy Commission). U. S. Patent 2,882,123. Apr. 14, 1959.

A process is described for the recovery of uranium from phosphatic products derived from phosphatic ores. It has been discovered that certain alkyl phosphatic derivatives can be employed in a direct solvent extraction operation to recover uranium from solid products, such as superphosphates, without first dissolving such solids. The organic extractants found suitable include alkyl derivatives of phosphoric, pyrophosphoric, phosphonic, and phosphitic acids wherein the alkyl portion of the derivative contains from 4 to 7 carbon atoms. A diluent such as kerosene is also used.

15195

SOLVENT EXTRACTION PROCESS FOR PLUTONIUM. G. T. Seaborg (to U. S. Atomic Energy Commission). U. S. Patent 2,882,124. Apr. 14, 1959.

The separation of plutonium from aqueous inorganic acid solutions by the use of a water immiscible organic extractant liquid is described. The plutonium must be in the oxidized state, and the solvents covered by the patent include nitromethane, nitroethane, nitropropane, and nitrobenzene. The use of a salting out agent, such as ammonium nitrate in the case of an aqueous nitric acid solution is advantageous. After contacting the aqueous solution with the organic extractant, the resulting extract and raffinate phases are separated. The plutonium may be recovered by any suitable method.

15196

VOLATILE FLUORIDE PROCESS FOR SEPARATING PLUTONIUM FROM OTHER MATERIALS. F. H. Spedding and A. S. Newton (to U. S. Atomic Energy Commission). U. S. Patnet 2,882,125. Apr. 14, 1959.

The separation of plutonium from uranium and/or fission products by formation of the higher fluorides of uranium and/or plutonium is discussed. Neutron-irradiated uranium metal is first converted to the hydride. This hydrided product is then treated with fluorine at about 315°C to form and volatilize UF_6 leaving plutonium behind. The plutonium may then be separated by reacting the residue with fluorine at about 500°C and collecting the volatile plutonium fluoride thus formed.

CONTROLLED THERMONUCLEAR PROCESSES

15197 AFOSR-TN-58-792

Plasmadyne Corp., Santa Ana, Calif.

ELEMENTARY CONSIDERATIONS OF THE DIRECT CONVERSION OF THERMONUCLEAR ENERGY TO ELECTRICAL ENERGY. Technical Note E-3TN098-332. Adriano C. Ducati. Sept. 1, 1958. 17p. Contract AF49 (638)-332. (AD-202225).

A feasibility study of power sources that might be used in conjunction with plasma jet propulsors was made. One power source is a direct thermonuclear converter. The elementary analysis is in two sections. The first considers the maximum energy that can be expected from certain fuels. The second considers the problem of extracting the energy from the fuel. The fuel currently most practical for the fusion reactor is deuterium. The reactions by which deuterons can fuse are discussed in detail. (A.C.)

15198 AFSWP-1072

Armed Forces Special Weapons Project, Washington, D. C.

SUMMARY OF SHERWOOD ACTIVITIES. Charles W. Hulburt. Dec. 10, 1957. Decl. June 12, 1959. 31p.

Problems associated with controlled thermonuclear reactions are discussed. Experimental devices such as stellerators, pinch devices, Pyratron (mirror machine), and Astron are covered as well as various miscellaneous projects. Diagrams are presented of Columbus, Perhapsatron, the stabilized pinch reactor, the triaxial pinch device, the homopolar device, Stellerator, Pyrotron, Felix, Table Top, Toy Top, and the Astron concepts. (J.R.D.)

15199 AFSWP-1092

Armed Forces Special Weapons Project, Washington, D. C.

SUMMARY OF SHERWOOD ACTIVITIES. Supplement No. 1, [for] December 10, 1957 through June 20, 1958. Charles W. Hulburt. July 1, 1958. Decl. June 12, 1959. 10p.

Progress made in the Sherwood Project is summarized. Experimental devices planned and operating are discussed. The Sherwood devices displayed at the Geneva Conference are listed. (For preceding period see AFSWP-1072.) (W.D.M.)

15200 LMSD-5074

Lockheed Aircraft Corp. Missile Systems Div., Sunnyvale, Calif.

THERMONUCLEAR PROPULSION WITH DEUTERIUM FUEL. E. Fisher. Sept. 1958. 26p. (AD-208007).

An analysis is made of a thermonuclear rocket power plant burning deuterium at 10^{9}°K. Aspects examined are the thermal load from the plasma on the motor walls, the cross sections and energies of the fusion reactions, the kinetics of the reactions, and an idealized performance of the jet. (auth)

15201 NYO-2538

New York Univ., New York, Atomic Energy Commission Computing and Applied Mathematics Center.

PAPERS PRESENTED AT THE SECOND INTERNATIONAL CONFERENCE ON THE PEACEFUL USES OF ATOMIC ENERGY, GENEVA, SEPTEMBER 1958. Jan. 30, 1959. 125p. Contract AT(30-1)-1480. \$19.80 (ph), \$6.30(mf) OTS.

This report contains corrected manuscripts of five Geneva papers A/CONF.15/P-374; 376; 386; 1765; 1538.

This report contains corrected manuscripts of five papers submitted by the New York University Sherwood group to the Second International Conference on the Peaceful Uses of Atomic Energy in Geneva, Sept. 1958, and which were abstracted in NSA, Vol. 12, as abstract Nos. 14870, 14871, 14881, 14882, and 15174. (auth)

15202 ORNL-2728
Oak Ridge National Lab., Tenn.
UNSTABLE PLASMA OSCILLATIONS IN A MAGNETIC FIELD. E. G. Harris. June 19, 1959. 29p. Contract W-7405-eng-26. $1.00(OTS).

Unstable oscillations of a uniform plasma in a constant uniform magnetic field are investigated using the Vlasov equations. It is found that if the velocity distributions of the electrons and ions are sufficiently anisotropic oscillations may occur whose amplitudes grow exponentially with time. Three different anisotropic distribution functions which lead to instabilities are studied. In one the electrons are all moving with the same velocity along the magnetic field and the ions are stationary. This case was previously considered by Buneman but without assuming the presence of a magnetic field. The second distribution function studied was one in which all electrons and ions move with the same speed perpendicular to the field. This case was previously considered by Malmfors, by Gross, and by Sen. This previous work is extended here. In the third distribution function considered the particles have a Maxwellian distribution of the velocity components perpendicular to the field. Provision is made in the function for varying the spread in the velocities in the direction of the field. If this spread in velocities along the field is sufficiently small unstable oscillations may occur. (auth)

15203
STATUS REPORT ON THERMONUCLEAR RESEARCH. A. E. Robson (Atomic Energy Research Establishment, Harwell, Berks, Eng.). Nuclear Power 4, No. 38, 98-101(1959) June.

The present state of development toward controlled thermonuclear fusion is briefly summarized. Containment, zeta modifications, pinch stabilization, fast condenser techniques, mirror machines, and direct conversion are discussed. (T.R.H.)

15204
STRONG HYDROMAGNETIC DISTURBANCES IN A COLLISION-FREE PLASMA. J. W. Dungey (King's Coll., Newcastle upon Tyne, Eng.). Phil. Mag. (8) 4, 585-93(1959) May.

An attempt is made to extend the exact pulse solutions at zero temperature to finite temperatures, and the heating of the plasma is studied. A linear treatment shows that the increase in the temperature is small except for very strong pulses. An approximate treatment of the gas pressure is found to be invalid for strong pulses at the experimental values of the initial temperature. Discussion of the ions which start with large thermal velocities shows that some of them are likely to gain energy, but that their effect on the field may be important at the experimental values. (auth)

CRITICALITY STUDIES

15205 AECU-4180
Combustion Engineering, Inc. Reactor Development Div., Windsor, Conn.
ANALYTICAL EVALUATION OF THE REACTIVITY WORTH OF A LUMPED ABSORBER. J. M. Stein and H. A. Vieweg. Dec. 11, 1956. 17p. (S1C/RP/56-104). $3.30(ph), $2.40(mf) OTS.

Period measurements were obtained for the removal of a lumped absorber from two different locations in a critical assembly. A two-group analytical evaluation, developed in the report, resulted in a value of 30.6 cents for boron steel strips removed from the center of core regions, as compared to a measured worth of 31.0 cents. A calculated worth of 42.9 cents was obtained for boron steel strips removed from near water gaps; the measured value was 36.6 cents. The difference between measured and calculated values for the water gap is greater due to inability to account for some local details with two group diffusion theory. The agreement noted between measured and calculated reactivity worths and consideration of the qualifications mentioned lends confidence to the application of the method involved to similar experiments with lumped absorbers. (auth)

15206 CF-59-4-120
Oak Ridge National Lab., Tenn.
PRELIMINARY REPORT ON 2% U^{235}-ENRICHED UF_4-$C_{25}H_{52}$ CRITICAL ASSEMBLIES. J. T. Mihalczo, J. J. Lynn, Dunlap Scott, and W. C. Connolly. Apr. 22, 1959. 42p. $7.80(ph), $3.30(mf) OTS.

A series of critical experiments with blocks of 2% U^{235}-enriched UF_4-$C_{25}H_{52}$ was initiated at the ORNL Critical Experiments Facility. Thus far assemblies with H:U^{235} atomic ratios of 195 and 294 were built in parallelepipedal and simulated cylindrical geometries, both reflected and unreflected. From the results the minimum critical masses for reflected spheres were determined to be 16.3 and 8.5 kg of U^{235} for fuel mixtures with H:U^{235} atomic ratios of 195 and 294, respectively. The minimum critical masses for unreflected spheres of these two fuel mixtures are 24.3 and 12.7 kg of U^{235}, respectively. (auth)

15207 HW-51828
General Electric Co. Hanford Atomic Products Operation, Richland, Wash.
BURST MAGNITUDES AND RADIATION LEVELS FOR THE PROPOSED CRITICAL MASS LABORATORY. J. A. Berberet. Aug. 14, 1957. Decl. Mar. 3, 1959. 9p. Contract W-31-109-eng-52. $1.80(ph), $1.80(mf) OTS.

Of the twelve unintentional "bursts" that have taken place in assemblies for making critical mass studies, the number of fissions in the largest was 1.67×10^{17}. The average number of fissions is 4.7×10^{16}. Both fast and thermal systems as well as homogeneous and nonhomogeneous systems were involved in these bursts. Using the history of these bursts together with a study of the proposed critical mass work as a basis, a burst of 3×10^{17} fissions is set as the maximum expected. For design purposes it is recommended that a much more conservative value of 10^{18} fissions be used for determining radiation limits. (auth)

15208 Y-1248
Union Carbide Nuclear Co. Y-12 Plant, Oak Ridge, Tenn.
CRITICAL ASSEMBLIES OF URANIUM METAL. R. Gwin and W. T. Mee. Mar. 26, 1959. 17p. Contract W-7405-eng-26. $0.75(OTS).

Data on critical assemblies of fissionable uranium metals are summarized. Empirical studies are made for specific reflectors and geometries to determine the feasibility of extrapolating these data for conditions concerning nuclear safety problems. Also included are the influences on critical systems by various reflectors, U-235 isotopic enrichment, density, and small metal pieces homogeneously distributed in water. (auth)

15209
TWO REGION STUDIES IN SLIGHTLY ENRICHED

WATER-MODERATED URANIUM AND URANIUM DIOXIDE LATTICES. John J. Volpe, George G. Smith, Daniel Klein, F. S. Frantz, and Jocelyn C. Andrews (Westinghouse Electric Corp., Pittsburgh). Nuclear Sci. and Eng. 5, 360-70(1959) June.

An experimental and analytical study of the flux distribution of two-region core configurations was made for the TRX facility. The purpose of this study was to obtain an estimate of the sizes of critical configurations that would yield the same values of the basic reactor parameters in the inner region as a critical core consisting entirely of the inner region material and geometry. Several two-region cores were constructed and experimental measurements of thermal utilization, resonance escape probability, and fast fission effects were performed. Slow and fast neutron activation distributions were also obtained. Two inner regions were constructed utilizing 1.3 wt.% enriched UO_2 fuel 0.384 in. in diameter and with a density of 10.53 gm/cm^3. A third inner region utilized 1.3 wt.% enriched uranium metal fuel with a diameter of 0.387 in. Light water served as the moderator and reflector in all cases. The experimental and theoretical results indicate that by utilizing two-region cores, measurements of microscopic parameters can be made for a wide variety of fuel sizes, fuel enrichments, and water-to-uranium volume ratios without the construction of full critical cores for each combination. (auth)

GEOLOGY AND MINERALOGY

15210 RME-2050

Grand Junction Operations Office. Salt Lake Branch Office, AEC.

NOTES ON GEOPHYSICAL WORK AT MARYSVALE, UTAH. Ray E. Gilbert. May 1958. 24p. $0.75(OTS).

The Marysvale area lies in south-central Utah, 175 miles south of Salt Lake City. Uranium deposits of the area are in volcanic and plutonic rocks of Tertiary age. Direct current resistivity methods were tested in two localities in the Marysvale area. In the Bullion Monarch mine area, an altered rhyolite dike was successfully traced by this method, and the information was used in planning diamond drilling for uranium occurrences within the dike. In the Lucky Strike area, an attempt was made to locate the contact between quartz monzonite and rhyolite agglomerate and to measure the thickness of the rhyolite. Subsequent diamond drilling proved the contact to be about 200 ft farther east and 100 ft deeper than was predicted from the resistivity work. The error may have been caused by a lack of homogeneity in the basal section of the rhyolite. Self-potential and resistivity methods were tested across the Prospector vein. Neither method detected the vein. Resistivity methods can be used to outline zones of intense alteration, thereby supplying desirable information on the location of uranium deposits in altered rhyolite. Magnetometer traverses could be run along the old resistivity lines to ascertain if comparable results may be obtained. (auth)

15211 TEI-750

Geological Survey, Washington, D. C.

GEOLOGIC INVESTIGATIONS OF RADIOACTIVE DEPOSITS. Semiannual Progress Report [for] June 1 to November 30, 1958. Dec. 1958. 147p. $3.00(OTS).

Studies were made of systematic geologic mapping and research, supported by appropriate geophysical and geochemical investigation, designed to develop information on the actual and potential reserves and resources of radioactive raw materials on the Colorado plateau. The size, shape, mineralogy, and geologic setting of different types of deposits are discussed. General field work on the physical properties of ore and host rock project is included. (For previous report see TEI-740.) (J.E.D.)

15212

PROBLEMS IN THE DISPOSAL OF ACID ALUMINUM NITRATE HIGH-LEVEL RADIOACTIVE WASTE SOLUTIONS BY INJECTION INTO DEEP-LYING PERMEABLE FORMATIONS. Edwin Roedder. U. S. Geol. Survey Bull. 1088. 1959. 69p. $0.40(GPO).

The problems of injection and the possibility of chemical reactions occurring upon contact between earth materials and typical high-level acid aluminum nitrate wastes, from atomic reactor fuel processing, are discussed in connection with proposed methods of disposal of such wastes by injection into deep-lying, brine-saturated permeable beds (salaquifers). To discuss the mechanics of the interaction of moving waste with salaquifer minerals, the concept of a "zone of equilibration" is developed and the factors modifying it are considered; it is shown that the width of the zone of equilibration controls the usable storage capacity of the salaquifer, per well. Although the known variables include physical effects, chemical effects, and rate processes, most of which cannot be calculated rigorously but can be truly evaluated only by large-scale tests, it is shown experimentally that reactions with carbonates, limonite, clays, and other typical salaquifer materials will occur. These reactions can reasonably be expected to cause the precipitation of aluminum and ferric hydroxide gels, effectively blocking further injection. Whether this stoppage will occur before the amount of waste pumped into the well is sufficient to make the procedure economically feasible depends upon various factors that cannot be evaluated precisely without a number of simplifying assumptions and further experimental work, but the procedure would appear to be feasible only under certain very special conditions. A few extrapolations of the data to other types of wastes and salaquifers are made, remedial procedures to avoid precipitation are discussed, and suggestions are offered for future studies, based on the pertinent literature. It is concluded from safety and technical considerations that if wastes are to be disposed by injection, the only truly realistic approach to the problem involves (a) removal of the more dangerous and heat-producing long-lived isotopes, (b) aging to remove short-lived heat-producing isotopes, (c) chemical pretreatment of the waste or salaquifer or both to improve compatibility, and (d) injection into a deep-lying salaquifer of glass-sand quality that is far below any potable waters and is very carefully selected after extensive exploration and testing. The procedure might be somewhat safer by some process whereby a portion of the salaquifer is sealed off to form a leakproof underground reservoir, but this cannot be substituted for adequate depth of burial. (auth)

15213

PRELIMINARY GEOLOGIC MAP OF THE CIRCLE CLIFFS 1 NE QUADRANGLE, GARFIELD COUNTY, UTAH. MINERAL INVESTIGATIONS FIELD STUDIES MAP MF-153. Edward S. Davidson and Robert A. Cadigan. Washington, U. S. Geological Survey, 1959. $0.50.

15214
PRELIMINARY GEOLOGIC AND STRUCTURE MAP OF THE NORTHWEST PART OF THE CASCADE SPRINGS QUADRANGLE, FALL RIVER COUNTY, SOUTH DAKOTA. MINERAL INVESTIGATIONS FIELD STUDIES MAP MF-207. E. V. Post and N. P. Cuppels. Washington, U. S. Geological Survey, 1959. $0.50.

15215
PRELIMINARY GEOLOGIC AND STRUCTURE MAP OF THE NORTHEAST PART OF THE CASCADE SPRINGS QUADRANGLE, FALL RIVER COUNTY, SOUTH DAKOTA. MINERAL INVESTIGATIONS FIELD STUDIES MAP MF-208. E. V. Post and D. W. Lane. Washington, U. S. Geological Survey, 1959. $0.50.

15216
PRELIMINARY GEOLOGIC AND STRUCTURE MAP OF THE WEST-CENTRAL PART OF THE CASCADE SPRINGS QUADRANGLE, FALL RIVER COUNTY, SOUTH DAKOTA. MINERAL INVESTIGATIONS FIELD STUDIES MAP MF-209. E. V. Post and N. P. Cuppels. Washington, U. S. Geological Survey, 1959. $0.50.

15217
PRELIMINARY GEOLOGIC AND STRUCTURE MAP OF THE EAST-CENTRAL PART OF THE CASCADE SPRINGS QUADRANGLE, FALL RIVER COUNTY, SOUTH DAKOTA. MINERAL INVESTIGATIONS FIELD STUDIES MAP MF-210. E. V. Post and D. W. Lane. Washington, U. S. Geological Survey, 1959. $0.50.

15218
PRELIMINARY GEOLOGIC AND STRUCTURE MAP OF THE SOUTHWEST PART OF THE CASCADE SPRINGS QUADRANGLE, FALL RIVER COUNTY, SOUTH DAKOTA. MINERAL INVESTIGATIONS FIELD STUDIES MAP MF-211. E. V. Post. Washington, U. S. Geological Survey, 1959. $0.50.

15219
PRELIMINARY GEOLOGIC AND STRUCTURE MAP OF THE SOUTHEAST PART OF THE CASCADE SPRINGS QUADRANGLE, FALL RIVER COUNTY, SOUTH DAKOTA. MINERAL INVESTIGATIONS FIELD STUDIES MAP MF-212. E. V. Post. Washington, U. S. Geological Survey, 1959. $0.50.

HEALTH AND SAFETY

15220 AD-208066
Ford Instrument Co., Long Island City, N. Y.
FALLOUT PREDICTOR. Quarterly Report No. 1 [for] July 1, 1958 to September 30, 1958. A. Richter. 56p. DA Project No. 3-99-04-112. Contract DA-36-039-SC-78185.

A study was made of a system to predict the pattern produced by radioactive debris from a nuclear explosion as it falls to the ground. The final system will consider the effect of bomb cloud development and structure, winds, rainout, topography, and particle settling rates. Previous systems were studied to determine the suitability of the method and the ways in which the methods may be improved. The development of various relations using a general purpose digital computer is discussed. The National Bureau of Standards solution is reviewed. This solution was programmed for a general purpose digital computer to provide a preliminary study of the application of digital techniques to the solution of the fall-out problem. A digital computer program to produce a prediction identical in all significant respects to that produced by the NBS predictor is discussed and simplified flow charts are presented for an improved program based on the NBS prediction. 97 references. (C.H.)

15221 AERE-L-101
United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.
A SHORT COURSE IN RADIOLOGICAL PROTECTION. R. J. Sherwood, ed. Mar. 1959. 155p. (AERE-HP/L-23(2nd. Ed)). $3.78(BIS).

A brief course in radiation protection was planned for those employing radioisotopes in various industrial applications. A brief outline of some of the fundamental considerations in radiological protection is included, and practical advice is presented of direct use to people actually engaged in handling radioactive materials. Forty-one photographs of equipment and numerous tables of data are included. (C.H.)

15222 AERE-R-2890
United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.
AN AIRBORNE RADIOMETRIC SURVEY OF THE WINDSCALE AREA, OCTOBER 19-22, 1957. D. Williams, R. S. Cambray, and S. C. Maskell. Dec. 1957. 26p. $0.63(BIS).

Declassified version of AERE-EL/R-2438.

The operation and results of a small scale airborne survey of the radioactive contamination on the ground following the Windscale accident of October 10, 1957, are described. The possibilities and limitations of the method are discussed. (auth)

15223 AFSWC-TN-56-26
Air Force Special Weapons Center, Kirtland AFB, N. Mex.
RADIOACTIVE CONTAMINATION OF AIRCRAFT. John W. Lane. May 29, 1956. 12p. Project No. 7801.

Some of the Air Force problems associated with aircraft contaminated with radioactive materials are discussed herein, particularly the hazards to aircrews and maintenance crews. The relative significance of internal and external hazards is given. Presently existing tolerance levels and a proposed set of new levels are presented. (auth)

15224 CNHW-(RP-1)
Canada. Dept. of National Health and Welfare. Radiation Protection Div., Ottawa.
PRELIMINARY REPORT ON THE MEASUREMENTS OF RADIOACTIVE STRONTIUM IN CANADIAN MILK POWDER SAMPLES. P. G. Mar and P. M. Bird. July 1958. 16p.

Determinations were made of the radiostrontium content of biological samples collected in various parts of Canada during 1957 and 1958. Data are included on the activity found in powdered milk samples processed from 1945 through part of 1958. (C.H.)

15225 DP-367
Du Pont de Nemours (E. I.) & Co. Savannah River Lab., Aiken, S. C.
REMOVAL OF TRITIUM CONTAMINATION FROM SURFACES OF METALS. Albert E. Symonds, Jr. Apr. 1959. 19p. Contract AT(07-2)-1. $0.75 OTS.

Heat treatments greatly enhance the removal of tritium contamination from metals that have been exposed to heavy water used as a reactor moderator. Heat treatment for 30 minutes at 300°C was found effective in removing general contamination. Quench treatments following the heating significantly improve the decontamination process. The "smear" technique for the detection of tritium on surfaces is much more sensitive and reliable if the paper smear is wet with a compound of low volatility, e.g., oil or glycerol. (auth)

15226 KY-273
Union Carbide Nuclear Co. Paducah Plant, Ky.
ENVIRONMENTAL MONITORING SUMMARY FOR THE PADUCAH PLANT FOR 1958. R. C. Baker and E. G. Brown. May 22, 1959. 13p. Contract W-7405-eng-26. $0.50(OTS).

Outdoor monitoring of air, water, and vegetation in the vicinity of the Paducah plant is summarized for the year of 1958. (auth)

15227 TID-5550
Division of Biology and Medicine, AEC.
RADIOACTIVE FALLOUT—A TWO-YEAR SUMMARY REPORT. Charles L. Dunham. May 1959. 112p. $1.25(OTS).

Prepared for Presentation at the Hearings on Fallout before the Joint Committee on Atomic Energy, May 5-8, 1959.

The rate of fall-out during the past 12 months is said to have increased to about twice the amount which has fallen out in any prior 12 months period. As much as 20 mc of strontium-90 per square mile was measured in some parts of the United States, and substantial increases in strontium-90 content were noted in milk and other foods. Large weapon testing is no longer predominantly near the equator. The AEC policy and procedures for the dissemination of information on fall-out to the public are reviewed. The present state of knowledge on the biological effects of fall-out is summarized. The problems involved in determining permissible levels of radiation exposure are discussed. The AEC research program on fall-out is summarized. The world-wide fall-out monitoring program is described briefly. Appended are statements on the biological hazards of carbon-14, current AEC research contracts and programs in soil chemistry and mineral metabolism of plants, the AEC program in oceanography and marine biology, radiation-induced life shortening and associated effects, a status report on radiation genetics, research programs in molecular biology, and a survey on the current status of the internal emitter program. (C.H.)

15228 TID-5556
Atomic Energy Commission, Washington, D. C. and Carnegie Institution of Washington, D. C.
STRATOSPHERIC FALLOUT PARTICULARLY FROM THE RUSSIAN OCTOBER SERIES. Willard F. Libby. May 1959. 19p. $0.50(OTS).

Presented at the Hearings on Fallout Before the Joint Committee on Atomic Energy, May 5-8, 1959.

Results are presented from a study of soil and rain data on fall-out following the intensive series of bomb tests fired by the U.S.S.R. in October, 1958. The Russian October series was estimated to have added about 12.5 to 15 megatons equivalent of fission products to the stratosphere, or a sudden increase of from 50 to 80% above the previous inventory. Various theories of the mechanism of stratospheric fall-out and the length of storage time are discussed. Data indicate that the residence time is about 3 years instead of 6 as previously estimated. The influence of latitude on the rate of fall-out is discussed. Data are included on the movement of bomb carbon-14, and the carbon-14 content of the troposphere and living matter. 15 references. (C.H.)

15229 TID-7569
Office of Industrial Relations. Safety and Fire Protection Branch, AEC.
PROCEEDINGS OF THE 1958 ATOMIC ENERGY COMMISSION AND CONTRACTOR SAFETY AND FIRE PROTECTION CONFERENCE, HELD AT ATOMIC ENERGY COMMISSION HEADQUARTERS BUILDING, GERMANTOWN, MARYLAND, JUNE 24-25, 1958. May 15, 1959. 124p. $2.50(OTS).

Sixteen papers are included. Separate abstracts have been prepared for each paper. (W.L.H.)

15230 TID-7569(p.1-3)
Union Carbide Nuclear Co. Y-12 Plant, Oak Ridge Tenn. and National Lead Co. of Ohio, Cincinnati.
INTEGRATED SAFETY ORGANIZATION IN NUCLEAR PLANTS. F. C. Lowry and J. A. Quigley. p.1-3 [of] PROCEEDINGS OF THE 1958 ATOMIC ENERGY COMMISSION AND CONTRACTOR SAFETY AND FIRE PROTECTION CONFERENCE, HELD AT ATOMIC ENERGY COMMISSION HEADQUARTERS BUILDING, GERMANTOWN, MARYLAND, JUNE 24-25, 1958. 3p.

The two basic types of nuclear safety organizations employed by Union Carbide Nuclear Company are described. The first type is illustrated by the setup of the Oak Ridge Gaseous Diffusion Plant and involves the complete organizational integration of the safety functions themselves. The safety, fire prevention, health physics, industrial hygiene, radiation control, mechanical testing and inspection, and medical organizations all report to one man who administers the functions as a staff division. The second type is evidenced by the organization of the Y-12 plant at Oak Ridge and represents the integration of organizationally separate safety functions through coordination of effort. Functional integration is achieved through a system of safety committees. (W.L.H.)

15231 TID-7569(p.4-9)
Division of Information Services, AEC.
PUBLIC RELATIONS FOLLOWING AEC ACCIDENTS. Morse Salisbury. p.4-9 [of] PROCEEDINGS OF THE 1958 ATOMIC ENERGY COMMISSION AND CONTRACTOR SAFETY AND FIRE PROTECTION CONFERENCE, HELD AT ATOMIC ENERGY COMMISSION HEADQUARTERS BUILDING, GERMANTOWN, MARYLAND, JUNE 24-25, 1958. 6p.

Accidents in nuclear plants involving radioactive materials are cited as to the effect of these accidents on the surrounding population. Ways are discussed of informing the public of the nature of accidents in nuclear plants. (W.L.H.)

15232 TID-7569(p.10-11)
Division of Inspection, AEC.
VIEWS OF THE AEC INSPECTION DIVISION ON SAFETY AND FIRE PROTECTION. Arthur Tackman. p.10-11 [of] PROCEEDINGS OF THE 1958 ATOMIC ENERGY COMMISSION AND CONTRACTOR SAFETY AND FIRE PROTECTION CONFERENCE, HELD AT ATOMIC ENERGY COMMISSION HEADQUARTERS BUILDING, GERMANTOWN, MARYLAND, JUNE 24-25, 1958. 2p.

The primary inspection and appraisal objectives are those of line management. Every effort is made to assure that the inspection methods and techniques are such as to demand priority attention to the safety- and fire-protection requirements, to assure line management of full information concerning such practices, and to give line management the most critical evaluation. (W.L.H.)

15233 TID-7569(p.12-15)
Liberty Mutual Insurance Co., Boston.
SAFETY PERSONNEL REQUIREMENTS IN NUCLEAR ENERGY PLANTS. Charles R. Williams. p.12-15 [of] PROCEEDINGS OF THE 1958 ATOMIC ENERGY COMMISSION AND CONTRACTOR SAFETY AND FIRE PROTECTION CONFERENCE, HELD AT ATOMIC ENERGY COMMISSION HEADQUARTERS BUILDING, GERMANTOWN, MARYLAND, JUNE 24-25, 1958. 4p.

The selection and training of safety personnel for nuclear energy plants are described. (W.L.H.)

15234 TID-7569(p.16-19)
Atomic Energy Commission, Washington, D. C.
IMPLICATIONS OF THE NEW LIABILITY REQUIREMENTS OF THE REVISED ATOMIC ENERGY ACT. Charles Eason. p.16-19 [of] PROCEEDINGS OF THE 1958 ATOMIC ENERGY COMMISSION AND CONTRACTOR SAFETY AND FIRE PROTECTION CONFERENCE, HELD AT ATOMIC ENERGY COMMISSION HEADQUARTERS BUILDING, GERMANTOWN, MARYLAND, JUNE 24-25, 1958. 4p.

The indemnity amendment is discussed. This amendment was designed as a means of limiting the liability of those engaged in atomic energy activities which are potentially hazardous and, at the same time, assuring that funds will be available to satisfy claims within limits specified in the same amendment. (W.L.H.)

15235 TID-7569(p.20-32)
Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.
SAFETY PROBLEMS AT TEST REACTORS. C. R. Shaber. p.20-32 [of] PROCEEDINGS OF THE 1958 ATOMIC ENERGY COMMISSION AND CONTRACTOR SAFETY AND FIRE PROTECTION CONFERENCE, HELD AT ATOMIC ENERGY COMMISSION HEADQUARTERS BUILDING, GERMANTOWN, MARYLAND, JUNE 24-25, 1958. 13p.

The safety problems at the Materials Testing Reactor and the Engineering Test Reactor are discussed in detail. (W.L.H.)

15236 TID-7569(p.33-9)
General Electric Co. Hanford Atomic Products Operation, Richland, Wash.
SPONTANEOUS IGNITION. William R. DeHollander. p.33-9 [of] PROCEEDINGS OF THE 1958 ATOMIC ENERGY COMMISSION AND CONTRACTOR SAFETY AND FIRE PROTECTION CONFERENCE, HELD AT ATOMIC ENERGY COMMISSION HEADQUARTERS BUILDING, GERMANTOWN, MARYLAND, JUNE 24-25, 1958. May 15, 1959. 7p.

The mechanisms of spontaneous ignition are discussed. The oxidation of zirconium in air and oxygen is described. Derived expressions are given for ignition temperatures of oxidizing systems. (W.L.H.)

15237 TID-7569(p.40-3)
Argonne National Lab., Lemont, Ill.
METAL FIRE AND EXPLOSION RESEARCH. J. Glenn Schnizlein. p.40-3 [of] PROCEEDINGS OF THE 1958 ATOMIC ENERGY COMMISSION AND CONTRACTOR SAFETY AND FIRE PROTECTION CONFERENCE, HELD AT ATOMIC ENERGY COMMISSION HEADQUARTERS BUILDING, GERMANTOWN, MARYLAND, JUNE 24-25, 1958. 4p.

A discussion is presented of a program directed toward determining the factors involved in the susceptibility of ignition of U, Zr, Th, and Pu. (W.L.H.)

15238 TID-7569(p.44-53)
General Electric Co. Hanford Atomic Products Operation, Richland, Wash.
SEPARATIONS PLANT SILVER REACTOR INCIDENT. E. R. Irish. p.44-53 [of] PROCEEDINGS OF THE 1958 ATOMIC ENERGY COMMISSION AND CONTRACTOR SAFETY AND FIRE PROTECTION CONFERENCE, HELD AT ATOMIC ENERGY COMMISSION HEADQUARTERS BUILDING, GERMANTOWN, MARYLAND, JUNE 24-25, 1958. 10p. (HW-57048).

A description of the dissolver cell equipment in the Purex Plant is given. Some of the chemical reactions occurring in the silver reactor are given. The operating experience of the silver reactor that exploded is traced. A detailed description is presented of the incident. (W.L.H.)

15239 TID-7569(p.54-67)
Atomic Energy Commission, Washington, D. C.
COST AND SAFETY CONSIDERATIONS IN THE TRANSPORT OF RADIOACTIVE MATERIALS. Harold A. Knapp. p.54-67 [of] PROCEEDINGS OF THE 1958 ATOMIC ENERGY COMMISSION AND CONTRACTOR SAFETY AND FIRE PROTECTION CONFERENCE. HELD AT ATOMIC ENERGY COMMISSION HEADQUARTERS BUILDING, GERMANTOWN, MARYLAND, JUNE 24-25, 1958. 14p.

The object of this presentation is to summarize, on the basis of available information, the frequency and severity of accidents that can be expected in rail, air, and truck shipments of radioactive materials and to describe the method for deciding when greater safety during shipment is worth additional cost. (W.L.H.)

15240 TID-7569(p.68-73)
Idaho Operations Office, AEC.
SHIPPING OF RADIOACTIVE MATERIALS AT THE NATIONAL REACTOR TESTING STATION. Ralph V. Batie. p.68-73 [of] PROCEEDINGS OF THE 1958 ATOMIC ENERGY COMMISSION AND CONTRACTOR SAFETY AND FIRE PROTECTION CONFERENCE, HELD AT ATOMIC ENERGY COMMISSION HEADQUARTERS BUILDING, GERMANTOWN, MARYLAND, JUNE 24-25, 1958. 6p.

A review of the shipment procedures for radioactive materials at the National Reactor Testing Station and an outline of the problems involved in these shipments is presented. (W.L.H.)

15241 TID-7569(p.74-85)
Atomic Energy Commission, Washington, D. C.
THE WINDSCALE INCIDENT. C. Rogers McCullough. p.74-85 [of] PROCEEDINGS OF THE 1958 ATOMIC ENERGY COMMISSION AND CONTRACTOR SAFETY AND FIRE PROTECTION CONFERENCE, HELD AT ATOMIC ENERGY COMMISSION HEADQUARTERS BUILDING, GERMANTOWN, MARYLAND, JUNE 24-25, 1958. 11p.

This discussion is broken into two parts. In the first part the accident and what actually happened is discussed. In the second part a few conclusions are drawn as to what this means and how we can profit by it. (W.L.H.)

15242 TID-7569(p.85-91)
Westinghouse Electric Corp. Bettis Atomic Power Div., Pittsburgh.

LESSONS LEARNED FROM PRESSURE-VESSEL ACCIDENT INVESTIGATIONS. B. F. Langer. p.85-91 [of] PROCEEDINGS OF THE 1958 ATOMIC ENERGY COMMISSION AND CONTRACTOR SAFETY AND FIRE PROTECTION CONFERENCE, HELD AT ATOMIC ENERGY COMMISSION HEADQUARTERS BUILDING, GERMANTOWN, MARYLAND, JUNE 24-25, 1958. 7p.

An accident involving the failure of an autoclave is discussed. The autoclave was $12\frac{3}{4}$ in. in inside diameter and about 6 ft long. The head came off the vessel at a threaded connection. The separation occurred in the threads between the flange nut and the autoclave vessel wall. The flange nut, bolting ring, and head all stayed together and were found about $\frac{1}{4}$ mile away. It was found that there was remarkably little tearing of metal. The flange nut had yielded outward so that it assumed an hourglass shape. (W.L.H.)

15243 TID-7569(p.92-106)

Union Carbide Chemicals Co., South Charleston, W. Va.
NONDESTRUCTIVE INSPECTION FROM AN ENGINEERING VIEWPOINT. Frank C. Parker. p.92-106 [of] PROCEEDINGS OF THE 1958 ATOMIC ENERGY COMMISSION AND CONTRACTOR SAFETY AND FIRE PROTECTION CONFERENCE, HELD AT ATOMIC ENERGY COMMISSION HEADQUARTERS BUILDING, GERMANTOWN, MARYLAND, JUNE 24-25, 1958. 15p.

Various inspection methods and instruments are described. (W.L.H.)

15244 TID-7569(p.108-14)

Atomic Energy Commission, Washington, D. C.; Factory Insurance Assn., Hartford, Conn.; and New York Operations Office, AEC.
WHEN IS CONTAMINATED PROPERTY DAMAGED? John H. Harley, Claire C. Palmiter, and John Troutman. p.108-14 [of] PROCEEDINGS OF THE 1958 ATOMIC ENERGY COMMISSION AND CONTRACTOR SAFETY AND FIRE PROTECTION CONFERENCE, HELD AT ATOMIC ENERGY COMMISSION HEADQUARTERS BUILDING, GERMANTOWN, MARYLAND, JUNE 24-25, 1958. 7p.

A discussion by a three man panel is presented. (W.L.H.)

15245 TID-7569(p.115-21)

Atomic Energy Commission, Washington, D. C.; Du Pont de Nemours (E. I.) & Co., Wilmington, Del.; and Westinghouse Electric Corp., Pittsburgh.
DEFINITION AND CLASSIFICATION OF RADIATION INJURIES. H. Duffus, E. J. Meyers, and T. S. Ely. p.115-21 [of] PROCEEDINGS OF THE 1958 ATOMIC ENERGY COMMISSION AND CONTRACTOR SAFETY AND FIRE PROTECTION CONFERENCE, HELD AT ATOMIC ENERGY COMMISSION HEADQUARTERS BUILDING, GERMANTOWN, MARYLAND, JUNE 24-25, 1958. 7p.

A discussion by a three man panel is presented. (W.L.H.)

15246 CEA-tr-A-521

ISOLEMENT DES AÉROSOLS RADIOACTIFS À L'AIDE DE FILTRES FIBREUX. (Separation of Radioactive Aerosols with Fibrous Filters.) W. Zumach. Translated into French from Atompraxis 3, 377-382(1957). 19p.

This paper was previously abstracted from the original language and appears in NSA, Vol. 12, as abstract No. 3564.

15247 CEA-tr-A-565

PROBLÈMES POSÉS PAR LA PROTECTION CONTRE LES RAYONNEMENTS DANS L'UTILISATION PACIFIQUE DE L'ÉNERGIE ATOMIQUE. (Problems Caused by Protection Against Radiation in the Peaceful Uses of Atomic Energy.) Robert G. Jaeger. Translated into French from Z. angew. Phys. 9, 467-8 (1957). 53p.

A review is presented of the problems posed by protection against radiation in the peaceful utilization of atomic energy. The establishment of admissible doses and units, limits of the admissible radiation level, particular problems caused by the exploitation of reactors, and the elimination of radioactive wastes are considered. An appendix lists recommendations, regulations, instructions, decrees, and laws relative to protection against radiation. 55 references. (J.S.R.)

15248

ATMOSPHERIC RADIOACTIVITY STUDIES AT THE U. S. NAVAL RESEARCH LABORATORY. L. B. Lockhart, Jr., R A. Baus, P. King, and I. H. Blifford, Jr. (Naval Research Lab., Washington, D. C.). J. Chem. Educ. 36, 291-5(1959) June.

Past monitoring activities at NRL are reviewed, and the present program is discussed. Rainwater sampling has been discontinued, but the operation of air monitoring stations continues. The other present monitoring activity is a study of latitudinal variation of air radioactivity at ground level over the 80th meridian (west). Data are given on: atmospheric radioactivity in 1957 for Washington, D. C., Kodiak, Alaska, and Yokosuka, Japan; geographical distribution of fission products in air during 1957; radioactivity versus latitude July 1957–June 1958; and variation in Sr^{90} contribution to gross fission product activity July 1957–Feb. 1958. (T.R.H.)

15249

A SIMPLE DEVICE FOR PERSONNEL MONITORING OF AN ACCIDENTAL NUCLEAR REACTION. H. F. Henry, J. C. Bailey, and R. C. Rohr (Oak Ridge Gaseous Diffusion Plant, Tenn.). Nuclear Sci. and Eng. 5, 285-90(1959) May.

The radioactive In^{116} produced by the $\mathrm{In}^{115}(n,\gamma)\ \mathrm{In}^{116}$ reaction has been utilized in a simple personnel monitoring device at the ORGDP for several years as a method for estimating the total radiation dosage received in the event of a possible accidental nuclear reaction. A 1-gm indium foil is placed in a standard plastic security badge; after a suspected exposure to an accidental burst, this foil is monitored by a β-γ survey meter, and the reading obtained used to determine the estimated dosage. A time-after-exposure correction factor is also used. For calibration of indium foil, an exposure to a light-water moderated critical reactor of highly enriched uranyl fluoride was evaluated and the results are indicated briefly. An instantaneous exposure of about 60 mrad is detectable immediately after an exposure even with the unsplit badges and one of about 120 mrad is detectable an hour after the occurrence. (auth)

15250

AIR RADIOACTIVITY IN CATANIA. B. Cantone, G. Pappalardo, and R. Ricamo (Università, Catania, Italy). Nuovo cimento (10) 12, 84-8(1959) Apr. 1.

Beta activity measurements of filters through which air had been drawn were made. Two sets of samples were taken: (500 l/10 min) and 10 to 60 m^3/hours, both outdoors and in enclosed spaces. Some decay products of radon and thoron and fission products were detected. The minimum and maximum activities found (in curies/1 × 10^{-13}) in outside samples were 1.68 and 52 for short samples and 3.5 and 14.2 for long samples; in inside samples: 47 and 220 for long samples and 114 and 179 for short (all Rn product activities). Thoron product activities found in long samples were (in curies/1 × 10^{-15}): 0.46 and 5.2 outside and 9.3 and 3.5 inside; for fission products: 1.3 and 1.3 outside, and 0.61 and 2.1 inside. A mean radioactivity of 6 × 10^{-13} curies/liter was found for inhabited rooms of average ventilation. (T.R.H.)

15251
THE Sr-90 FALLOUT AND THE AIR MOTION.
Y. Miyake, K. Saruhashi, and Y. Katsuragi (Meteorological Research Inst., Tokyo). Papers Meteorol. and Geophys. (Tokyo) 9, Nos. 3-4, 172-6(1959).

The cumulative amount of Sr-90 in Tokyo through the middle of 1958 reached 11.3 mc/km^2. The fall rate of Sr-90 has the positive correlation of +0.69 with the rainfall amount but it has no spring maximum as suggested by Machta et al. The estimated amount of fallout in the future will be about 50 mc/km^2 even if nuclear tests stop now. The average age of fallout which is calculated from the ratio of Sr-89 and Sr-90 was from 200 to 300 days. The difference between the atmospheric ozone and the Sr-90 in the stratosphere is discussed. It is concluded that the radioactive deposit on the earth is affected by locations and seasons of injection of Sr-90 into the stratosphere as well as the turbulent motion on a larger scale. (auth)

15252
STRATOSPHERIC FALLOUT OF STRONTIUM-89 AND BARIUM-140. Lois Fry and P. K. Kuroda (Univ. of Arkansas, Fayetteville). Science 129, 1742-3(1959) June 26.

A series of nuclear test explosions which occurred in the fall of 1958 caused a very large increase of Sr^{89} and Ba^{140} in the stratosphere. The Ba^{140}/Sr^{89} ratio in the stratosphere, and hence in the troposphere, has decreased steadily since then with a half-life of approximately 17 days. (auth)

15253
RADIOACTIVE FALL-OUT, PROVISIONAL SCHEME OF PUBLIC CONTROL. Manual of Civil Defence, Volume 1, Pamphlet No. 2. London, Her Majesty's Stationery Office, 1956. 20p. $0.17.

Principles and procedures are outlined for securing control of the public in areas affected by the residual radioactivity resulting from the explosion of a nuclear weapon burst on or near the ground. The people affected are assumed to be in their homes or at their places of work. The primary objective of the scheme is the reduction of the amount of radiation sickness. The principles of the provisional scheme, the warning system, categorization of zones, and the operation of the control scheme are discussed. (C.H.)

INSTRUMENTS

15254 AD-112969
Radiation Research Corp., West Palm Beach, Fla.
NUCLEAR BATTERIES. Final Progress Report [for] July 15, 1955—July 15, 1956. John H. Coleman and Jerome Goodman. 32p. DA Project No. 3-99-09-022. Contract DA-36-039-SC-70117.

The conductivity under high energy irradiation was studied during this contract year for diamond, sapphire, polystyrene, inhibited polystyrene, and polyester. The "decreasing conductivity effect" was not always observed. A new strontium battery using a laminated dielectric was designed to increase life. The laminated structure is applied to a new krypton battery. The construction of radioactive batteries using gaseous isotopes was proved feasible. Both Kr^{85} and tritium batteries were completed. The sorption capacity of metals for tritium gas was re-examined for producing high current beta sources in a small volume. Infrared absorption studies of the thin polystyrene dielectric films made by the gas discharge method indicated the presence of impurities, particularly combined oxygen, in the films. Characteristics of a tritium battery using both a vacuum and a solid dielectric were examined. The design and cost of a C^{14} battery were studied. (See also NP-6629.) (auth)

15255 AD-149957
Army Signal Engineering Labs., Fort Monmouth, N. J.
NEUTRON DOSIMETRY AT THE U. S. ARMY SIGNAL ENGINEERING LABORATORIES. Technical Memorandum M-1917. Harry M. Murphy, Jr. Nov. 1, 1957. 31p.

A survey was made of methods for the measurement of biologically significant fast-neutron doses, especially when combined with an associated gamma dose. A discussion is included of neutron dose units and the design and performance of various neutron dosimetry systems. It is concluded that further research in neutron dosimetry is needed. (C.H.)

15256 AD-153574
Chatham Electronics Corp., Livingston, N. J.
POCKET CHAMBER AND CHARGER-READER. Interim Development Report 33 [for] September 1, 1953 to September 30, 1953. Oct. 5, 1953. 29p. Contract NObsr-49156.

The design of a radiac set consisting of two 600 r pocket ionization chambers and one charger-reader is reported. The pocket chamber will be a small cylinder containing an ionization chamber, a capacitor, and a diaphragm type switch. It will be capable of being charged and read by means of a separate charger-reader. The charger-reader will consist of an electrostatic voltmeter as an indicator, a friction generator to furnish the charge and a switch to actuate the diaphragm and permit charging of the pocket chamber. The preliminary design of the pocket chamber has been worked out in detail. (auth)

15257 AD-153575
Chatham Electronics Corp., Livingston, N. J.
POCKET-CHAMBER AND CHARGER-READER. Internal Development Report No. 34 [for] the Period October 1 to October 31, 1953. Nov. 17, 1953. 15p. Contract NObsr-49156.

Fabrication of the parts for the pocket chambers based on the preliminary design drawings has been completed. Assembly of these parts pointed up one problem in particular—sealing the rubber diaphragm to the formica contact rod and to the aluminum case. Further investigation must be made to obtain a suitable cement for this purpose. Preliminary design of the voltmeter unit of the charger-reader was completed. This will essentially be a miniaturized electrostatic voltmeter employing a single high plate and a butter-fly type vane. A pointer attached to the vane and moving over a fixed calibrated scale will be used as the indicator. (auth)

15258 AD-153576
Chatham Electronics Corp., Livingston, N. J.
POCKET-CHAMBER AND CHARGER-READER.
Interim Development Report No. 44 [for] August 1, 1954 to August 31, 1954. 11p. Contract NObsr-49156.

Post-radiation leakage tests at room and elevated temperatures were conducted on the chambers having 0.009 in. Teflon and Kel-F coated electrodes. Leakage at room temperature is satisfactory but leakage at elevated temperatures is high. Post-radiation leakage after 15 hr between the exposure and the reading indicated improvement over previously reported data. Tests showed that in the chambers with Teflon coatings under 0.009 in. thick, post-radiation leakage is greater. The Kel-F coated parts with coating thicknesses under 0.009 in. are in the process of assembly. Drop test of the Charger-Reader resulted in damage to the pivots causing a shift in the charging voltage. (auth)

15259 AD-153577
Chatham Electronics Corp., Livingston, N. J.
POCKET-CHAMBER AND CHARGER-READER. Interim Development Report No. 37 [for] the Period January 1 to January 31, 1954. Feb. 18, 1954. 16p. Contract NObsr-49156.

The proposed increase in the length of the pocket chamber plus a change in the ionization chamber geometry proved successful in obtaining a 600-r chamber. Five pocket-chambers were assembled and subject to radiation tests. These tests showed that two chambers had a range of 600-r. The proposed increase in the voltage of the charger-reader voltmeter was not attempted due to the satisfactory results obtained. Since the fabrication of the parts for the developmental models of the charger-reader had not been completed, three voltmeter assemblies, using a roentgen scale, were used in the preliminary model to determine the range of the newly assembled chambers. All of the voltmeters used gave similar results for particular chambers. (auth)

15260 AD-157598
Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
A FAST NEUTRON SCINTILLATION SPECTROMETER (thesis). Harry I. Axelrod. Mar. 1958. 43p.

A fast neutron scintillation spectrometer consisting of a $Li^6I(Eu)$ phosphor photomultiplier tube and associated amplification, pulse analyzing, and counting equipment was constructed. The Li^6 enrichment and thickness of the crystal is determined by a theoretical consideration of neutron-to-gamma sensitivity. Calibration with gamma-rays and neutrons determined the gamma-ray-equivalent Q of the $Li^6(n,\alpha)H^3$ reaction from which a neutron calibration curve was constructed. A Po—Be neutron spectrum corrected for Li^6 absorption cross section and gamma-ray flux is the final result. The correction for degraded neutrons scattered into the crystal from the surroundings could not be made since fast monoenergetic neutron sources were not available. Based on the experimental work performed and work done at ORNL, a cooled $Li^6I(Eu)$ phosphor offers promise as a laboratory tool for fast neutron spectroscopy. (auth)

15261 AD-202541
Texas. Agricultural and Mechanical Coll., College Station. Engineering Experiment Station.
DESIGN OF A LOW LEVEL GAMMA IRRADIATION FACILITY. John D. Randall. July 1, 1958. 27p. Contracts DA-49-007-MD-945(T) and DA-49-007-MD-947.

The design is described of a low-level cobalt-60 gamma irradiation facility for the exposure of small animals. (C.H.)

15262 AD-204454
Frankford Arsenal. Fire Control Lab., Philadelphia.
A PROPOSAL FOR EVALUATING AND IMPROVING ACCELEROMETERS. Technical Note No. 1108. Vernon Ames, Meyer Shulman, and Saul Wanetick. Sept. 3, 1958. 15p. DA project No. 5W13-01-007.

A program for improving conventional piezoelectric accelerometers is proposed. New concepts in accelerometer design are proposed using other than the piezoelectric principle as a solution to eliminate secondary effects which affect sensitivity and linearity characteristics. (auth)

15263 AD-209700
Controls for Radiation, Inc., Cambridge, Mass.
DEVELOPMENT OF A TACTICAL GAMMA NEUTRON DOSIMETER. Bi-Monthly Progress Report No. 3 [for] November 1, 1958—December 31, 1958. I. A. Berstein, R. C. Fix, J. E. Mayer, Jr., and P. F. Russo. Jan. 5, 1959. 6p. Contract DA 18-108-405-CML-198.

Assembling and testing of the various components and instruments used in the equipment for automatically filling and sealing E-5 dosimeter ampoules were studied. Brief descriptions applied to each component such as the oxygen analyzer, atmosphere gas control apparatus, pH measurement device, and water and trichloroethylene purifiers are given. In addition, phenol red purification is described, as well as water deaeration, a sealing unit temperature measuring system, and the operator equipment and instrument platform. (For preceding period see AD-211297.) (J.R.D.)

15264 AD-211296
Controls for Radiation, Inc., Cambridge, Mass.
DEVELOPMENT OF A TACTICAL GAMMA NEUTRON DOSIMETER. Bi-Monthly Progress Report No. 1 [for] July 1, 1958—August 31, 1958. I. A. Berstein, R. C. Fix, J. E. Mayer, Jr., and P. F. Russo. Sept. 1, 1958. 4p. Contract DA 18-108-405-CML-198.

Design of equipment for automatically filling and sealing E-5 dosimeter ampoules was investigated. Ampoules were sealed using a Nichrome resistance loop; however, the seal was not entirely satisfactory. In addition, glo-bars, (silicon carbide heating elements) were investigated. The commercially available glo-bars are too large for ampoule sealing application, and it is thought that smaller designs would be too costly. A promising combination of glo-bars with Pt—Rh alloys is scheduled for testing. (J.R.D.)

15265 AD-211297
Controls for Radiation, Inc., Cambridge, Mass.
DEVELOPMENT OF A TACTICAL GAMMA NEUTRON DOSIMETER. Bi-Monthly Progress Report No. 2 [for] September 1, 1958—October 31, 1958. I. A. Berstein, R. C. Fix, J. E. Mayer, Jr., and P. F. Russo. Nov. 1, 1958. 8p. Contract DA-18-108-405-CML-198.

An 80% Pt—20% Rh alloy was investigated for sealing E-5 dosimeter ampoules. Very favorable results were obtained. A number of sealing units consisting of Pt—Rh alloy imbedded in cement were constructed and studied. It was concluded that with minor modifications automatic filling and sealing equipment can be assembled and put into use. The use of RF induction heating was also investigated. Several ampoules were successfully sealed by this method, and further investigation is proposed. (For preceding period see AD-211296.) (J.R.D.)

15266 AERE-R-2905
United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.
PRELIMINARY REPORT ON THE POSSIBILITY OF A. C. OPERATION OF IONISATION CHAMBERS. D. L. Roberts. Apr. 1959. 38p. $0.77(BIS).

This investigation is concerned with using an a-c polarizing voltage on a standard RC/1 ionization chamber in an effort to achieve a simple, self-monitoring and fail safe instrumentation scheme primarily for shut down channels. (W.L.H.)

15267 ARDE-(M)-64/57
Gt. Brit. Armament Research and Development Establishment, Fort Halstead, Kent, England.
A PROTECTION CALCULATOR FOR GAMMA-RADIOGRAPHY. R. S. Morgan. Dec. 1957. (AD-204674).

A calculator is described by means of which various calculations associated with protection from gamma radiation can readily be evaluated. Scales are provided for the thickness of the lead or concrete shielding required to give a specified dose-rate of radiation at various distances from the four sources in common use, iridium-192, cesium-137, radium (or radon), and cobalt-60. The instrument is self-contained and the juxtaposition of the scales is such that the determination of the thickness of lead required to produce a specified dose-rate of radiation on the surface of a source-container (normally a laborious calculation) can be made conveniently and rapidly and with sufficient accuracy for most practical purposes. A commercial version of the calculator is illustrated. (auth)

15268 CRDC-847
Atomic Energy of Canada Ltd., Chalk River, Ont.
APPARATUS FOR ROUTINE QUANTITATIVE ESTIMATION OF RADIONUCLIDES BY γ-SCINTILLATION SPECTROMETRY. R. C. Hawkings and W. J. Edwards. Nov. 1958. 37p. (AECL-819). $1.00(AECL).

A NaI(Tl) scintillation spectrometer designed for the routine quantitative estimation of γ-emitting nuclides is described. Standard commercially canned NaI(Tl) crystals are employed. The selection of crystals, photomultipliers, radiation shields, and beta absorber, is discussed. Details for the construction of scintillation units, radiation shields, source mounts, and source positioners, are given. The calibration of a 1½" × 1" and a 3" × 3" (bevelled) NaI(Tl) scintillation detector is described. Experimentally determined photopeak efficiencies for these crystals are presented as a function of photon energy and source to crystal distance. Overall efficiency factors for a number of specific nuclides are given as a function of source mount, source to crystal distance, and bias level. (auth)

15269 DP-362
Du Pont de Nemours (E. I.) & Co. Savannah River Lab., Aiken, S. C.
NEUTRON MONITOR FOR INACCESSIBLE LOCATIONS. Alwyn C. Lapsley. Apr. 1959. 10p. Contract AT(07-2)-1. $0.50 OTS.

A method is described for installing a BF_3 counter used for neutron measurements at an inaccessible location. The counter is pushed through pipe conduits up to 50 feet long. A simple circuit, involving no electronic components at the detector location, serves to transmit the pulses from the counter over long lengths of cable. (auth)

15270 HW-59821
General Electric Co. Hanford Atomic Products Operation, Richland, Wash.
SOLAR RADIATION INTEGRATOR. D. P. Brown and R. A. Harvey. Apr. 15, 1959. 21p. Contract W-31-109-eng-52. $3.30(ph), $2.40(mf) OTS.

An integrator is described for averaging the output of a pyrheliometer, an instrument for measuring solar radiation intensity. The integrator utilizes a passive smoothing network which automatically records periodically the weighted average of the previous period's radiation. The results of the machine compare favorably with manual graphical analyses. (T.R.H.)

15271 LA-2307
Los Alamos Scientific Lab., N. Mex.
HEAT CAPACITY OF COPPER BELOW 300°K, A TEST OF TWO CALORIMETER DESIGNS. Thomas A. Sandenaw. Mar. 1959. 18p. Contract W-7405-eng-36. $0.75(OTS).

Two designs of adiabatic calorimeters, in which the surroundings follow the temperature of a test specimen at all times from the lowest temperature achieved by cooling up to room temperature, are described. Values for the heat capacity of oxygen-free, high conductivity copper are given in order to show the reliability to be expected from determinations of heat capacity of elements in which the self-heating by radioactive disintegration is appreciable and can be used as the sole source of heating. Equations based on least-squares analysis of data are listed for the OFHC copper. The methods of numerical integration used for thermodynamic properties are described and values of entropy and enthalpy of copper at 298.15°K are shown. (auth)

15272 NARF-59-20T
Convair, Fort Worth, Tex.
AN ELECTROPLATED NEUTRON THERMOPILE FOR THE 3-Mw GTR. F. P. Harmon. Feb. 20, 1959. 26p. Project 6(1-9964). Contract AF33(600)-32054. (MR-N-226).

A neutron-sensitive thermopile which utilizes an electroplating technique for making thermoelectric couples was developed. This technique offers improved flexibility in design at reduced cost in that it eliminates the usual soldered or welded couples. The thermopile described was constructed for use in the Ground Test Reactor. It consists of a large number of equally spaced junctions extending the length of the reactor core. The signal output is therefore proportional to the integral of the thermal flux distribution along the length of the thermopile. Other features of the thermopile include (1) 100 B^{10}-coated hot junctions and 100 bare cold junctions positioned for ambient-temperature compensation; (2) sensitivity of 10 microvolts per kilowatt reactor power at 2.5 inches from the reactor face; and (3) a time constant of less than one second. Methods used in determining the characteristics of the thermocouple are described. (auth)

15273 NBS-TN-1
National Bureau of Standards, Washington, D. C.
A DOUBLE-PULSE TOTAL-ABSORPTION FAST NEUTRON SPECTROMETER. L. J. Nicastro and R. S. Caswell. Apr. 24, 1959. 27p. (PB-151360). $0.75 (OTS).

A fast neutron spectrometer utilizing the double-pulse total absorption technique was developed for use in the energy range 1 to 20 Mev. The total absorption spectrometer uses a hydrogenous scintillator, in which a fast neutron may lose all its energy, together with a detector for slow neutrons. Scintillation detection of the disintegration caused by absorption of a slow neutron in an element of high reaction cross section serves to identify those neutrons which lost essentially all their energy in the hydrogenous scintillator. Various organic liquid scintillators loaded with natural methyl borate, and a plastic scintillator with a boron-10 or lithium-6 slow neutron scintillation detector nearby were all tested with monoenergetic neutrons obtained from the $D(d,n)He^3$ and $T(d,n)He^4$ reactions. The best experimental results were obtained with a plastic scintillator and a $Li^6I(Eu)$ crystal. Representative data for this spectrometer are given. For comparison purposes, the results of Monte Carlo calculations, for a phenylcyclohexane liquid scintillator loaded with methyl borate (B^{10} enriched), are also included. (auth)

15274 NP-7613
Stanford Research Inst., Menlo Park, Calif.
OBTAINING A SYSTEM OF DOSIMETRY. Report No. 14 (Final) [for] Period September 28, 1956 to March 31, 1959. S. I. Taimuty. Mar. 16, 1959. 105p. Project No. 7-84-01-002. Contract DA 19-129-QM-766.

Progress is reported in the development of dosimetry systems for use with electron beams and gamma sources during the irradiation of foods and food products. The dose range to be measured is from 10^4 to 10^7 rads at dose rates up to 5×10^8 rads/min. A literature survey was made and 18 integrating dosimeters were chosen for experimental evaluation. Included were four aqueous solutions, four luminescent solids, four glasses, two plastics, nitrous oxide gas, cyclohexane gas evolution, and acid production by chlorinated hydrocarbons. The performance of these dosimeters was rated against the desirable requirements. Only four of the dosimeters came close to meeting the requirements. Cobalt glass and ceric sulfate aqueous solution dosimeters were selected for further development. Continuous beam current and beam energy monitors were developed for use with electron accelerators. One of the current monitors is based on measurement of low energy secondary electrons emitted from the surface of a metallic foil in vacuo through which the total beam is transmitted. The device provides a linear response independent of energy over a wide range. Two energy monitoring techniques were developed based on measurements of beam intensity as a function of depth in irradiated materials. One technique utilizes a stack of aluminum foils or plates, each of which is insulated from its neighbors. The second technique involves the use of small secondary emission chambers, imbedded at various depths in water-filled chambers, to monitor intensity as a function of depth. The continuous gamma source monitor consists of a spherical graphite cavity ionization chamber designed for satisfactory operation at dose rates as high as 10^7 rads/hr. (C.H.)

15275 ORNL-2647
Oak Ridge National Lab., Tenn.
INSTRUMENTATION AND CONTROLS DIVISION ANNUAL PROGRESS REPORT FOR PERIOD ENDING JULY 1, 1958. June 24, 1959. 138p. Contract W-7405-eng-26. $2.75(OTS).

Brief reports are given on developments related to: decimal printout for 256-channel pulse-height analyzer, new count-rate meters for area monitoring, hand and foot radiation monitor, punched paper tape data recorders for ORACLE input, Duo-Plasmatron ion source, BSF accelerator, continuous water monitor for radioactive wastes, x-ray scintillation crystals, instrumentation for self-sintering waste disposal, instrumentation for fuel element dissolution, particle counting and inventory techniques in a Jury ion exchange column, radiation effects on Pt vs. Pt—Rh thermocouples, anodic decontamination for instrument sensing elements, automatic Kelvin bridge resistance recorder, instrumentation for metallurgical creep-testing lab., logarithmic response gamma radiation monitor, avalanche diode regulated potentiometer current supply, broad-band transistorized field current supply, magnetic flowmeter test and calibration, high-temperature turbine flowmeters, liquid metal level transducer tests, data handling system, fused salt continuous level element, HRP instrumentation fast-release electromagnet for pool-type reactors, TSR-II instrumentation and control, counting rate meter, and a log N amplifier. (For preceding period see ORNL-2480.) (T.R.H.)

15276 ORO-184
Virginia. Univ., Charlottesville. Ordnance Research Lab.
A THERMAL FLOWMETER FOR THE MEASUREMENT OF MASS FLOW OF GASES AT PRESSURES ABOVE 1 mm Hg ABSOLUTE. Donald F. Nieman. May 22, 1959. 10p. Contract [AT(40-1)-1779]. (UVA/ORL-1779-59-TM-1). $1.80(ph), $1.80(mf) OTS.

A thermal flowmeter used to determine mass flow of gasses is described. In the range of temperature, pressure, and mass flow investigated the meter calibration is independent of pressure for helium, xenon, and xenon—helium mixtures. The method consists of allowing the gas to flow between two regions which are maintained at different but constant temperatures. The communication between the source and sink thus defined is by means of low thermal conductivity, and low heat capacity tubes. The temperature gradients in the metering tubes are a function of the enthalpy flow attendant with gas flow. (J.R.D.)

15277 RIB-40
David Sarnoff Research Center, Princeton, N. J.
DEVELOPMENT OF HIGH SPEED ELECTRON ACCELERATOR STRUCTURES. Interim Report No. 8. J. A. Baicker, R. M. Matheson, A. H. Sommer, and G. O. Fowler. May 31, 1959. 16p. Contract AT(30-1)-1958. $3.30(ph), $2.40(mf) OTS.

The development of a photomultiplier with better time resolution than those available at present is described. A beam deflection coincidence tube for use with the photomultiplier was investigated. With conventional deflecting plates, time resolution of 5×10^{-11} sec was measured. Distributed deflecting plates were studied. The dark pulse reduction required for low energy particle counting is discussed. A few tests on scintillation track imaging using the intensifier orthicon are described. (W.D.M.)

15278 SCTM-84-59(15)
Sandia Corp., Albuquerque, N. Mex.
A SYSTEM FOR RETRIEVAL OF CIRCUIT CARD DATA. William K. Paulus. Mar. 25, 1959. 17p. Contract [AT(29-1)-789]. $3.30(ph), $2.40(mf) OTS.

An information retrieval system is presented which locates printed circuit cards meeting a functional request description, and which produces tabulations of specific data about a given circuit card. A list of request terms (descriptors) is included, as well as the list of codes used to find data. The system uses commercial equipment available in Sandia Corporation. (auth)

15279 SCTM-103-59(15)
Sandia Corp., Albuquerque, N. Mex.
DESCRIPTOR DICTIONARY. (A Subject Authority for Electrical and Mechanical Devices.) W. K. Paulus. Apr. 8, 1959. 74p. Contract [AT(29-1)-789]. $12.30 (ph), $4.50 (mf) OTS.

A descriptor dictionary is presented as phase one of a two-phase index. The second phase is an information retrieval device which can be used to obtain specific information which was previously stored in some sort of memory. Since the second phase consists of two time-separated actions, storage and request, a correlating procedure is needed to assure that information is requested in the same terms that it was stored and that similar information is stored consistently. The descriptor dictionary is such a correlator. It attempts to list for each subject in the memory of the retrieval device its significant facets. These facets are expressed as descriptors or descriptive words which then serve both cataloguer to place information in memory and requester to gain access to desired information. Electrical and mechanical commercial devices and components pertinent to automated data systems are subject of this descriptor dictionary. It is being presented without discussion of its background or the reasons for its form to answer a growing demand for retrieval techniques. Since the organization of a correlater is not a negligible task, it seems suitable to present this example while the general discussion is still in preparation. (auth)

15280 SCTM-142-59(15)
Sandia Corp., Albuquerque, N. Mex.
VOLTAGE TO FREQUENCY CONVERTER. E. J. Bernard. May 25, 1959. 13p. Contract [AT(29-1)-789]. $3.30(ph), $2.40(mf) OTS.

A device is described which will convert a DC voltage to an AC voltage whose frequency is proportional to the DC input voltage. The instrument uses transistors and square-hysteresis-loop transformers, and consists of four units; conversion unit, output unit, input unit, and power supply unit. It is shown that the conversion unit will operate over a wide temperature range with an accuracy of 1% or better. (auth)

15281 WADC-TR-58-380
Illinois Inst. of Tech., Chicago. Armour Research Foundation.
RESEARCH ON SCINTILLATION CRYSTALS AND THEIR ACTIVATORS: I. ZONE MELTING AND ZONE LEVELING OF LiI(Tl), II. COMPACTION AND ACTIVATION OF SCINTILLATORS, III. EFFECT OF COLOR CENTERS ON THE SCINTILLATION OF KI(Tl). [Period covered:] June 1, 1956—May 14, 1958. Harold V. Watts, Robert H. Bragg, Frank A. Pizzarello, and Earle F. Ditzel. June 1958. 67p. Project No. 7112. Contract AF33 (616)-3748. (AD-155861).

The techniques of zone melting and zone leveling were applied to the preparation of thallium activated lithium iodide, a scintillator system in which it is known to be very difficult to incorporate a uniform thallium concentration with more standard crystal growth methods. Lithium iodide was successfully purified by zone melting; and a thallium doped ingot prepared by zone leveling the pure lithium iodide was found to be a scintillator of optimum pulse height with a uniform thallium concentration, maintained for about half of the total ingot length of eight inches. Many of the problems of production of scintillators by crystal growth methods may be bypassed by the successful application of the high pressure compaction technique to the production of scintillators. In this technique one starts with a microcrystalline powder of the scintillator material and compacts this in an evacuated piston die at pressures of the order of 100,000 psi, to form a clear, transparent mass. The compaction process is found not to adversely affect the scintillation pulse characteristics of the sodium iodide, potassium iodide, and lithium iodide scintillators. A study of powder preparation methods was made and the required compaction pressures are found for many of the alkali halides. The compaction technique allows the usage of diverse activation methods in the preparation of scintillators. Some of these methods have been investigated. Since the creation and ionization of color centers are processes which compete with scintillation for the energy absorbed from the impinging nuclear radiation, a correlation of luminescence characteristics versus color center concentrations was studied to gain insight into the details of the influence of defects in scintillators. Studies of luminescence from thallium activated potassium iodide crystals, given a continuous irradiation with Sr-90 beta particles, show a continuous decrease in luminous intensity and progressive changes in the build up or decrease of various absorption bands. Over-all decreases in luminous intensity seem to be explainable in terms of a combination of radiation induced optical absorption and destruction of activators, with the latter cause being predominant. (auth)

15282 CEA-tr-296
ETUDE DE TUBES COMPTEURS A CATHODES FROIDES. (Study of Counter Tubes with Cold Cathodes.) W. Rentsch. Translated into French by M. DuLong from Hochfrequenztech. u. Elektro-Akust. 65, 66-8(1956). 11p.

A cold-cathode counter tube filled with rare gas and having hollow cathodes is described. The advantage of the hollow cathodes over plane cathodes is explained. In extreme cases up to 10^5 periodic pulses/sec can be counted. An electronic counter with four cold-cathode tubes which operates for pulse frequencies up to 10^4/sec is described. The counter can be used for the counting of Geiger pulses. (tr-auth)

15283
THE USE OF IONIZATION CHAMBERS AS CURRENT SOURCES. Daniel Blanc, Éric Fort, Robert Lacoste, and Jean Lagasse. Compt. rend. 248, 2984-6(1959) May 25. (In French)

An ionization chamber with parallel electrodes, filled with air or argon under atmospheric pressure, was used as a source of current. For air, its internal resistance is 5×10^{14} Ω, and it is 10^{15} Ω for argon. With such a source of current, resistances up to 10^{13} Ω can be measured. (tr-auth)

15284
ON THE INFLUENCE OF THE AFTER-RIPENING OF PHOTOGRAPHIC LAYERS ON THEIR SENSITIVITY AND FOGGING. Milena Závětová (Czechoslovak Academy of Sciences, Prague). Czechoslov. J. Phys. 7, 506-8(1957). (In Czech.)

Sensitivity and fogging after ripening were studied at room temperature, 60 ± $^3/_4$°C, and relative humidity of 5%. The characteristic curves were plotted at a fogging density of 0.2°. All measurements were made with Panchro-Super films prepared without stabilization or sensibilization. The diagram of the specimen sensitivity dependence on time indicates a rapid rise of sensitivity which reaches the maximum after 21 hours: The fogging increases linearly, first slowly and then rapidly after a certain point. According to the curves the sensitivity is at its maximum at the changing point. The sensitivity of the preliminary irradiated materials is different but fogging reacts the same. Diagrams of sensitivity and fogging changes in nonstable layers tested for 6 months show a sharp drop in the sensitivity which levels off after three months, while the fogging first rapidly increases, then slows down. (R.V.J.)

15285

AN INSTRUMENT FOR THE RESOLUTION OF THE COMPONENTS OF THE DOUBLET K_{α_1,α_2} ON X-RAY DIFFRACTION PHOTOGRAPHS. Jan Čermák (Czechoslovak Academy of Sciences, Prague). Czechoslov. J. Phys. 7, 748-56(1957). (In Czech.)

A description is presented of a simple electrically modulated device for the resolution of the components of K_{α_1} and K_{α_2} on photometric curves obtained from the x-ray diffraction pictures or from the measurements taken by Geiger-Mueller counters. (tr-auth)

15286

A SLOW NEUTRON DETECTOR. Miroslav Voříšek (Czechoslovak Academy of Sciences, Prague). Czechoslov. J. Phys. 7, 757-66(1957). (In German)

A scintillation detector for thermal and resonance neutrons prepared from a molten mixture of ZnS(Ag) and B_2O_3 is described. With optimum behavior of both components and optimum detector thickness, a relatively great efficiency (up to 25%) was obtained. The detector can also be used in high gamma backgrounds since the efficiency of the gamma detection could be reduced below 10^{-7}% by appropriate calibration of the discriminator with an efficiency for thermal neutrons of approximately 6%. (tr-auth)

15287

PASSIVE ELEMENTS FORM TIME DELAY. Alfred A. Windsor (Univ. of California, Berkeley). Electronics 32, No. 3, 70(1959) Jan. 16.

Variable time delay circuits using only passive elements and offering reliability and stability are described. Delay units have been built with delays ranging from 5 μsec to 5 millisec with a stability of better than 0.1% of delay time in the presence of temperature, humidity, and magnetic field changes. (T.R.H.)

15288

IONIZATION DETECTORS. U. Facchini (CISE, Milan). Energia nucleare (Milan) 6, 237-48(1959) Apr. (In Italian)

A survey is made concerning the most recent developments of ionization detectors. In particular, new types of these chambers and new methods of employing them are described. Also the use of these devices in the analysis of radioactive minerals is briefly explained. Particles spectrometers based on coincidence systems of proportional counters and scintillators are then illustrated, and their utilization in energy and mass measurements is discussed. (auth)

15289

A MAGNETIC SPECTROMETER FOR CHARGED PARTICLES. S. B. Karmohapatro (Saha Inst. of Nuclear Physics, Calcutta). Indian J. Phys. 33, 139-47(1959) Mar.

A Siegbahn-Svartholm type magnetic spectrometer, designed for focusing ~ 1 Mev protons is described. Results of the measurement of the magnetic field and its gradient are given. Performance of the instrument in the low field region was tested with the conversion electron spectrum of Cs-137 source. Experiments showing the resolution, dispersion, and axial focussing properties are presented. (auth)

15290

CORRECTION OF THE OBSERVED RATIO FOR ERRORS ASSOCIATED WITH ION CURRENT COLLECTION AND AMPLIFICATION IN DUAL COLLECTOR MASS SPECTROMETERS. Jennings Capellen and Harry J. Svec (Iowa State Coll., Ames). Iowa State Coll. J. Sci. 33, 427-30(1959) May 15.

A method is described whereby the true ratio of two currents reaching the dual collectors in mass spectrometers may be determined from the observed ratio obtained by the null method. A detailed procedure is given along with the notation used in calculation and an illustrative example. (J.R.D.)

15291

SERVOLOGARITHMIC AMPLIFIER FOR REACTOR INSTRUMENTATION. W. J. Hartin (Bendix Aviation Corp., Detroit). IRE Trans. Nuclear Sci. NS-6, 11-14 (1959) Mar.

The instrument described is a servo which provides an output proportional to the logarithm of the input over 4 decades. Use of a special four-decade exponential feedback potentiometer makes the accuracy and repeatability much better than that obtainable with the usual logarithmic amplifiers. A period trip circuit is part of the instrument. (auth)

15292

NANOSECOND PULSE TRANSFORMERS. C. Norman Winningstad (Tektronix, Inc., Portland, Ore.). IRE Trans. Nuclear Sci. NS-6, 26-31(1959) Mar.

The transmission-line approach to the design of transformers yields a unit with no first-order rise-time limit since this approach uses distributed rather than lumped constants. The total time delay through the transmission-line-type transformer may exceed the rise time by a large factor, unlike conventional transformers. The extra winding length can be employed to improve the low-frequency response of the unit. Transformers can be made for impedance matching, pulse inverting, and d-c isolation within the range of about 30 to 300 ohms with rise times of less than 0.5×10^{-9} seconds, and magnetizing time constants in excess of 5×10^{-7} seconds. Voltage-reflection coefficients of 0.05 or less, and voltage-transmission efficiencies of 0.95 or better can be achieved. (auth)

15293

A CHRONOTRON FOR RELATIVISTIC NEUTRON TIME-OF-FLIGHT MEASUREMENTS. Robert H. Ragsdale (Univ. of California, Berkeley) and Warren Fenton Stubbins (Univ. of Cincinnati). IRE Trans. Nuclear Sci. NS-6, 31-4(1959) Mar.

Neutrons in pulses produced at a 19 mc rate by the circulating beam of the 184-inch cyclotron striking an internal target have kinetic energies from 100 to 800 Mev. Circulating-beam bunching limits the time duration of each neutron pulse. Reference signals are produced by a Cherenkov-radiator internal target on the radio-frequency voltage on the cyclotron dee. The chronotron coincidence circuits, capable of a resolving time of less than 10^{-9} second, are spaced with increasing time intervals to reduce reflection reinforcement. Saturation of coincidence ciruits minimizes the dependence on signal amplitude. The 125-Ω cable is matched at sampling points by a series inductance tapped by tube input capacity. (auth)

15294

PRELIMINARY OBSERVATIONS ON METHODS OF MEASURING MECHANICAL PROPERTIES OF SOLIDS AT HIGH TEMPERATURES. Barry L. Mordike and Leo M. Fitzgerald (Research Lab. for the Physics and Chemistry of Solids, Cambridge, Eng.). J. Less-Common Metals 1, 132-8(1959) Apr.

A review of work concerning the properties of solids at very high temperature is presented. The tensile strength of refractory metals at temperatures up to 2500°C was investigated. In addition, research on the coefficient of friction of metallic carbides and its variation with temperature is reported. Equipment and techniques are described as well as probable future developments. (J.R.D.)

15295

OPENER FOR RADIOISOTOPE BOTTLES. G. R. Taylor and H. A. Malcolm (Northern Ireland Radiotherapy Centre, Purdysburn, Belfast). J. Sci. Instr. 36, 291-2 (1959) June.

A radioisotope-bottle opener is described which prevents "spraying" of the radioactive solution on opening the bottle. (A.C.)

15296

MEASUREMENTS WITH RADIOISOTOPES. III. RESOLVING EFFICIENCY OF MEASUREMENTS. J. Oppelt (Research Inst. of Radiology, Prague). Jaderna Energie 4, 377-86(1958). (In Czech.)

The performance of ionization counters and the dependence of their resolving efficiency on various parameters are analyzed. The quality of measurements and various conditions and apparatus efficiencies are compared. (tr-auth)

15297

PROPANE BUBBLE CHAMBER. A. Loria, P. Mittner, I. Scotoni, and G. Zago (Istituto di Fisica dell'Universita, Padua and Istituto Nazionale di Fisica Nucleare, Padua). Nuovo cimento (10) 11, 718-24(1959) Mar. 1. (In Italian).

A propane bubble chamber of about two liters volume is described: details concerning the membrane expansion mechanism, the structure of the windows and the illuminating system are given. Some features of the use of it, recently made at the CERN synchrocyclotron, are indicated. (auth)

15298

PERFORMANCE OF A LARGE AREA NON FOCUSING ČERENKOV COUNTER AND ABSOLUTE YIELD OF ČERENKOV LIGHT. G. Caglioti, R. Cervellati, and L. Mezzetti (Universita, Rome and Istituto Nazionale di Fisica Nucleare, Rome). Nuovo cimento (10) 11, 850-60(1959) Mar. 16.

The design and the performance of a large area, comparatively thin toluene Cherenkov counter are described. The velocity resolution of nonfocusing Cherenkov counters and its basic limitation, due to the Landau fluctuations in the emission of fast knock-on electrons, are discussed and compared with those of scintillation counters. The absolute yield of the Cherenkov light is evaluated from the measurements and found to be in good agreement with the theoretical yield. (auth)

15299

EXPERIMENTS ON A ION SOURCE FOR AN ELECTROMAGNETIC ISOTOPE SEPARATOR. F. Bisi and B. De Michelis (Istituto di Fisica Sperimentale del Politecnico, Milan). Nuovo cimento (10) 11, 861-8(1959) Mar. 16.

A hot cathode, magnetic ion source for an electromagnetic isotope separator, is described. The source, useful both for gaseous and solid charge materials, gives a total ion output of about 20 mA. Measurements on discharge characteristics, extracted currents, and source efficiency are reported and the effects of introducing reflecting electrodes in the discharge chamber are discussed. (auth)

15300

RADIATION DETECTORS. 4. SOME APPLICATIONS. W. R. Loosemore (Atomic Energy Research Establishment, Harwell, Berks, Eng.). Nuclear Power 4, No. 38, 112-16(1959) June.

Some of the uses of radiation detection instruments in research and industry are described. Limitations of G-M counters are discussed. Energy measurement and x-ray fluorescence spectroscopy with gas ionization proportional counters are described. The use of gas ionization counters in fast neutron hazard evaluation and low activity assay is also described. Other instrument uses discussed are thickness gaging, gamma scintillation spectroscopy, and whole-body monitoring. (T.R.H.)

15301

THE SEPARATION OF ISOTOPES IN THE ULTRACENTRIFUGE. Anatol Selecki (Univ. of Warsaw). Nukleonika 4, 13-33(1959). (In Polish)

Basic problems underlying the use of high-speed centrifuges to separate isotopes are discussed. Particular consideration is given to recent advances in the design of ultracentrifuges. A general theoretical analysis of the operation of isotope separation by ultracentrifuging is outlined. Experimental results are reviewed. (auth)

15302

ROLE OF DOUBLE-QUANTUM TRANSITIONS IN MASERS. Shaul Yatsiv (Stanford Univ., Calif). Phys. Rev. 113, 1538-44(1959) Mar. 15.

A generalized treatment of a three-level maser as an example of double-irradiation experiments is based on a previous analysis of multiple-quantum transitions in nuclear magnetic resonance. The emphasis in the present treatment, as distinct from other expositions of the same problem, is on the role of the double-quantum transitions. In particular, conditions are found in which the maser operation is mainly governed by the double-quantum process and does not require a true "pumping" stage. Such a case is realizable in practice but its technical applicability is questionable. A study of the behavior of various transitions in this example is instructive for understanding the general role of the double-quantum transitions in double-resonance experiments. (auth)

15303

A DEVICE FOR MEASURING NUCLEAR QUADRUPOLE RESONANCE. E. I. Fedin and Yu. S. Konstantinov (Inst. of Elementary Organic Complexes, Academy of Sciences, U.S.S.R.). Pribory i Tekh. Ekspt. No. 2, 27-30(1959) Mar.-Apr. (In Russian)

A design is presented of a sensitive quadrupole radiofrequency spectrometer with second harmonic signal recording. Relations were derived which were used for evaluating the intensity and shape of the nuclear quadrupole resonance uncovered by the method. (tr-auth)

15304

SHAPES OF THE LINES IN PURE QUADRUPOLE RESONANCE. V. S. Grechishkin (Leningrad State Univ.). Pribory i Tekh. Ekspt. No. 2, 31-3(1959) Mar.-Apr. (In Russian)

A device is described for observing pure quadrupole resonance. The Wang scheme was used for reproducing the shape of the lines, and a self-damping super-generator was used for finding the unknown lines. The described super-generator is highly sensitive. Potassium chlorate, weighing 50 g at rare air temperature, permits observations of oscilloscope signals at a signal/noise ratio of ~120. (tr-auth)

15305

MAGNETIC FIELD RECORDER WITH DISTANCE CONTROL. L. N. Gertsiger. Pribory i Tekh. Ekspt. No. 2, 33-5(1959) Mar.-Apr. (In Russian)

A measuring device is described for recording magnetic field intensities at 0.3 to 20 kilogauss, based on the principle of nuclear magnetic resonance. The device is controlled by a tube generator frequency by means of a seignettoelectric condenser. (tr-auth)

15306

AN AUTODYNE THREE-CENTIMETER RANGE RADIOFREQUENCY SPECTROMETER FOR STUDYING ELECTRON PARAMAGNETIC RESONANCE. S. A. Akhmanov, S. D. Gvozdover, Yu. S. Konstantinov, and I. T. Trofimenko (Moscow State Univ.). Pribory i Tekh. Ekspt. No. 2, 38-40(1959) Mar.-Apr. (In Russian)

A three-centimeter-range generator in a moving-wave tube with a closed external feed-back circuit was used for studying electron paramagnetic resonance. The generator frequency was determined by vibration contours in the feed-back circuit; the specimen was then placed in the contour. The design of the radiospectroscope is included. (tr-auth)

15307

AUTOMATIC "PHASE" SPECTROPHOTOMETER FOR 0.21 TO 2.5 μ RANGE. V. I. Dianov-Klokov (Inst. of Elementary Organic Complexes, Academy of Sciences, U.S.S.R.). Pribory i Tekh. Ekspt. No. 2, 45-9(1959) Mar.-Apr. (In Russian)

The electric scheme is given for a two-beam "phase" spectrophotometer for the 0.21 to 2.5 μ range. The photomultiplier, FEU-25 with a sodium salicylate layer (0.21 to 0.65 μ), and the photoresistance, FS-Al (0.65 to 2.5 μ), were used as the energy receivers. Spectrograms are taken at 0.5 to 1 min interval. (tr-auth)

15308

ON FLUORIMETRIC MEASUREMENTS AT LOW-FREQUENCY MODULATION OF THE LIGHT FLOW. A. M. Bonch-Bruevich and V. P. Kovalev (State Optical Inst.). Pribory i Tekh. Ekspt. No. 2, 49-52(1959) Mar.-Apr. (In Russian)

Descriptions are presented of the phasometric device for a low-frequency "fluorimeter" apparatus used in phase studies of luminescence at 10^{-3} to 10^{-7} sec. Applications of the modulation method for fluorimetric measurements are discussed. (tr-auth)

15309

EXPERIMENTAL PHASE FLUORIMETER. A. M. Bonch-Bruevich, I. V. Karazin, V. A. Molchanov, and V. I. Shirokov (State Optical Inst.). Pribory i Tekh. Ekspt. No. 2, 53-6(1959) Mar.-Apr. (In Russian)

A design is presented of a new laboratory phase fluorimeter with a phasometric section resolving power of ~0.1, which corresponds to 2×10^{-11} sec at a selected modulation frequency of light flow. The high sensitivity of the apparatus permits measurements of luminescence several times weaker than the luminescence of alkali fluorescein solutions. (tr-auth)

15310

RADIOACTIVE IONIZATION MANOMETER FOR HIGH VACUUM. A. I. Akishin (Scientific-Research Inst. of Nuclear Physics, Moscow). Pribory i Tekh. Ekspt. No. 2, 78-80(1959) Mar.-Apr. (In Russian)

A design is presented of a high-sensitivity radioactive ionization manometer for measuring high vacuum. The high sensitivity of the manometer is achieved by using an electron multiplier as a preliminary ion current intensifier. (tr-auth)

15311

MINIATURE RADIOFREQUENCY MASS SPECTROMETERS. E. F. Doil'nitsyn, A. I. Trubetskoi, and M. Ya. Shcherbakova (Inst. of Geology and Geophysics, Siberian Branch of the Academy of Sciences, U.S.S.R.). Pribory i Tekh. Ekspt. No. 2, 81-2(1959) Mar.-Apr. (In Russian)

A design is given of a miniature, light-weight mass spectrometer, with a resolving power up to 16, which can be used for measuring various electrovacuum materials and for general gas analysis. (R.V.J.)

15312

IONIZATION VACUUM GAGE FOR PRESSURE MEASUREMENTS. V. M. Gavrilyuk and Ya. M. Kucherov (Inst. of Physics, Academy of Sciences, Ukrainian S.S.R.). Pribory i Tekh. Ekspt. No. 2, 83-5(1959) Mar.-Apr. (In Russian)

An ionization vacuum gage for measuring pressures up to 10^{-4} to 10^{-10} mm mercury is described. (R.V.J.)

15313

A DEVICE FOR AUTOMATIC MEASUREMENTS OF MULTIPLE SCATTERING PARTICLES. G. E. Belovitskii, L. N. Korablev, L. V. Sukhov, and I. V. Shtranikh (Inst. of Physics, Academy of Sciences, U.S.S.R.). Pribory i Tekh. Ekspt. No. 2, 86-90(1959) Mar.-Apr. (In Russian)

A device was designed for automatically measuring the length of and recording multiple Coulomb scattering interactions. The construction consists of transducers installed in a microscope and of an electron apparatus operating on the principle of discrete calculations. The highly efficient device permits more accurate and faster measurements of scattering and can also be used with Wilson and bubble chambers. (tr-auth)

15314

ECONOMIC COMPUTER WITH 2 MAGNETIC CORES. Sh. I. Barilko, L. S. Gorn, and B. I. Khazanov. Pribory i Tekh. Ekspt. No. 2, 91-4(1959) Mar.-Apr. (In Russian)

A digital computing scheme using semiconducting triodes and magnetic cores with rectangular hysteresis loops is described. The utilization of the magnetic memory device eliminates the use of current in the absence of incoming signals and is very economical. The power consumption is proportional to the frequency of the recorded pulses and is 0.004 w/kgc. (R.V.J.)

15315

SELECTION OF OPTIMUM AMPLIFIER PASSBAND IN

IONIZATION CHAMBERS. A. A. Vorob'ev, V. A. Korol'ev, and G. E. Solyakin (Inst. of Physics and Tech., Academy of Sciences, U.S.S.R.). Pribory i Tekh. Ekspt. No. 2, 95-102(1959) Mar.-Apr. (In Russian)

Calculations were made of the optimum passband for amplifiers with two differentiating circuits. It is shown that introduction of the second differentiating circuit completely eliminates the influence of microphonic effects and low-frequency interferences without affecting the signal and noise. (tr-auth)

15316

ON SOME PROPERTIES OF NEGATIVE BACK FEEDING CIRCUITS AND THEIR APPLICATIONS IN ELECTRON INTENSITY SEPARATOR. A. I. Aizenshtein (Kolarov Plant Lab., Sofia). Pribory i Tekh. Ekspt. No. 2, 103-7(1959) Mar.-Apr. (In Russian)

The effects of negative feed-back in alternating and direct current at various intensities of incandescence and anode and triode aging are investigated. (tr-auth)

15317

SELECTOR OF SMALLER PULSES. A. I. Belyaevskii (Inst. of Physics and Tech., Academy of Sciences, U.S.S.R.). Pribory i Tekh. Ekspt. No. 2, 111-12(1959) Mar.-Apr. (In Russian)

A design is suggested for a linear gating circuit with n equivalent inlets and two outlets through which are passing two time-coincident pulses; the larger one passes through one outlet while the weaker one passes through the other outlet. Single pulses do not pass the second outlet. (tr-auth)

15318

SCALE RECORDINGS IN SCALING SCHEMES. Yu. K. Akimov (Joint Inst. of Nuclear Research, Dubna, U.S.S.R.). Pribory i Tekh. Ekspt. No. 2, 113-14(1959) Mar.-Apr. (In Russian)

The use of coincidence schemes in scaling devices develops a higher order of precision of the measured chaotically distributed pulses. (tr-auth)

15319

STABILIZATION OF ELECTROMAGNET CURRENT. Yu. N. Denisov and G. M. Osetinskii (Joint Inst. of Nuclear Research, Dubna, U.S.S.R.). Pribory i Tekh. Ekspt. No. 2, 148-50(1959) Mar.-Apr. (In Russian)

Two types of current stabilizing schemes are described for installations feeding electromagnetic windings. The magnitudes of currents stabilized for various electromagnets were from 5 to 4000 a. Stability within 0.01 to 0.5% was achieved. (tr-auth)

15320

THE SCINTILLATION COUNTER STABILITY AMPLIFIER. A. M. Ivanchenko (All-Union Research Inst. of Chemical Reagents, Kharkov). Pribory i Tekh. Ekspt. No. 2, 150-1(1959) Mar.-Apr. (In Russian)

A design is suggested for a scintillation counter with a stabilizing device based on the principle of automatically controlled amplification of the linear track along the control signal. (R.V.J.)

15321

ELECTRON-OPTICAL RECORDING OF ELECTRICAL DISCHARGE IN GAS. E. N. Brago. Vestnik Akad. Nauk S.S.S.R. 29, No. 3, 52-4(1959) Mar. (In Russian)

Descriptions are given of a high-speed space-time, electronic-optical chronometer with photographic recording in the range 10^{-8} sec. The maximum scanning rate of the chronometer is $v_m = 1.6 \times 10^9$ mm/sec, resolving image is $\delta = 18$ lines/mm; resolving time maximum is $\Delta t = 3.5 \times 10^{-11}$ sec; the photocathode maximum spectral sensitivity is at $\lambda = 4000$ A; and the integral sensitivity is $\eta = 40$ μa/lmm. (R.V.J.)

15322

NEW MAGNETIC RADIOSPECTROMETER. A. G. Semenov and N. N. Bubnov. Vestnik Akad. Nauk S.S.S.R. 29, No. 3, 55-8(1959) Mar. (In Russian)

The design is presented of a new magnetic radiospectrometer for measuring electron paramagnetic resonance in chemical research. The spectrometer sensitivity is about 4×10^{-10} mole of diphenylpicrylhydrazyl free organic radical in recording the electron paramagnetic resonance lines on the electron beam oscillograph and 8×10^{-12} mole in automatic recording. The spectrometer has an automatic klystron adjuster and an automatic electron paramagnetic resonance spectrum recorder. (R.V.J.)

15323

ON THE DECOMPOSITION OF QUENCHING GAS IN G-M COUNTERS. Li Teh-ping and Kiu Shih-hua. Wu Li Hsüeh Pao 14, 136-8(1958). (In Chinese)

Measurements of the pressure-rise in G-M counters filled with argon and alcohol indicate that, corresponding to each ion pair produced in the discharge, the increase in number of gaseous molecules due to alcohol decomposition lies between 5 to 10. This number increases as the overvoltage is lowered. Thus the counting life of a counter can not be expressed merely in terms of quantity of electric charge passing through it. Some possible explanations are discussed. (auth)

15324

A WAVE-LENGTH INDEPENDENT, SENSITIVE DOSIMETER OF LUMINESCENT MATERIAL FOR X RADIATION. E. Krokowski (Freien Universität, Berlin). Z. Naturforsch. 14b, 304-6(1959) May. (In German)

A sensitive dosimeter of luminescent material for x radiation, which permits measurements between 30 and 250 kv, independent of the wave length and direction, is described. Because of the small measuring volume, the dosimeter is especially suitable for point measurements of spatial dose distribution. (tr-auth)

15325

LIQUID SCINTILLATION COUNTING. Proceedings of a Conference Held at Northwestern University, August 20-22, 1957. Carlos G. Bell, Jr. and F. Newton Hayes, eds. New York, Pergamon Press, 1958. 300p.

An account is given of a conference on liquid scintillation counting at Northwestern University in 1957. The volume has six parts as follows: (1) Fundamental Principles; (2) Instrumentation; (3) Chemistry of the Counting Sample; (4) General Applications; (5) Specific Applications; (6) Developments in Foreign Laboratories. (A.C.)

15326

MULTIPLE SOURCE RADIO-ACTIVE DEVICE. (to The Foxboro Co.). British Patent 813,148. May 13, 1959.

A rotating device for positioning various radioactive sources in a radiometric thickness gage is described. A cylinder containing the sources at fixed positions is rotated inside a sleeve or tube which has openings to expose the sources or for adjustment of the sources. The arrangement is such that the sources cannot be exposed at adjustment openings. (T.R.H.)

15327

IMPROVEMENTS IN OR RELATING TO RADIATION INTENSITY MEASURING APPARATUS. (to Atomic Energy of Canada Ltd.). British Patent 813,491. May 21, 1959.

A radiation intensity measuring instrument is described in which the output of a halogen-quenched Geiger-Mueller tube is added to the current for recharging the capacitor between the anode and cathode of a cold-cathode trigger tube. This sum current flows through an indicator circuit giving an over-all logarithmic characteristic with increased range of measurement. (T.R.H.)

15328

IMPROVEMENTS IN ELECTROSCOPES FOR RADIATION DETECTION. Ronald Paterson Henderson and William James Southward (to Philips Electrical Industries, Ltd.). British Patent 813,615. May 21, 1959.

A quartz-fiber personnel dosimeter is described in which a real image of the graticule or scale is formed in the plane of movement of the fiber with a magnification of one. The light for illumination enters axially, and the scale is read at the end of the housing tube. (T.R.H.)

15329

IMPROVEMENTS IN ELECTROSCOPES FOR RADIATION DETECTION. Ronald Paterson Henderson and William James Southward (to Philips Electrical Industries, Ltd.). British Patent 813,616. May 21, 1959.

An insulated-fiber electroscope design is offered. (T.R.H.)

15330

ULTRA-STABILIZED D. C. AMPLIFIER. E. C. Hartwig, R. W. Kuenning, and R. C. Acker (to U. S. Atomic Energy Commission). U. S. Patent 2,874,235. Feb. 17, 1959.

An improved circuit is described for stabilizing the drift and minimizing the noise and hum level of d-c amplifiers so that the output voltage will be zero when the input is zero. In its detailed aspects, the disclosed circuit incorporates a d-c amplifier having a signal input, a second input, and an output circuit coupled back to the first input of the amplifier through inverse feedback means. An electronically driven chopper having a pair of fixed contacts and a moveable contact alternately connects the two inputs of a difference amplifier to the signal input. The A. E. error signal produced in the difference amplifier is amplified, rectified, and applied to the second input of the amplifier as the d-c stabilizing voltage.

15331

RADIATION INTEGRATOR. F. M. Glass and H. N. Wilson (to U. S. Atomic Energy Commission). U. S. Patent 2,874,305. Feb. 17, 1959.

Radiation detecting and measuring systems, particularly a compact, integrating, background monitor, are discussed. One of the principal features of the system is the use of an electrometer tube where the input of the tube is directly connected to an electrode of the radiation detector and a capacitor is coupled to the tube input. When a predetermined quantity of radiation has been integrated, a trigger signal is fed to a recorder and a charge is delivered to the capacitor to render the tube inoperative. The capacitor is then recharged for the next period of operation. With this arrangement there is a substantial reduction in lead lengths and the principal components may be enclosed and hermetically sealed to insure low leakage.

15332

MEASURING APPARATUS. T. P. Kohman and B. W. Weissbourd (to U. S. Atomic Energy Commission). U. S. Patent 2,874,306. Feb. 17, 1959.

An ion chamber assembly is presented for measuring neutron emission of a relatively slow rate from a radioactive sample. The detecting apparatus comprises a container filled with neutron slowing material and having a cavity where a neutron source may be located centrally in the container. A plurality of ion chamber units are disposed equidistantly from the source and from each other for detecting the neutron radiation. Each of the ion chamber units has an ion chamber and a second chamber of substantially the same diameter as the ion chamber and in end-to-end relationship therewith. The second chamber contains paraffin and an axially disposed lead-in conductor for the ion chamber central electrode. The preamplifier circuit whose input is connected to the lead-in conductor is housed in a third container arranged in end-to-end relationship with the second chamber.

15333

PERSONNEL DOSIMETER. R. D. Birkhoff, H. H. Hubbell, Jr., and R. M. Johnson (to U. S. Atomic Energy Commission). U. S. Patent 2,875,343. Feb. 24, 1959.

A personnel dosimeter sensitive to both gamma and beta radiation is described. The dosimeter consists of an electrically conductive cylinder having a wall thickness of substantially 7 milligrams per square centimeter and an electrode disposed axially within the cylinder and insulated therefrom to maintain a potential impressed between the electrode and the cylinder. A cylindrical perforated shield provided with a known percentage of void area is disposed concentrically about the cylinder. The shield is formed of a material which does not contain more than 15 percent of an element higher than atomic weight 13. The dose actually received is at most the gamma dose plus the beta dose indicated by discharge of the dosimeter divided by the known percentage.

15334

BEAM CONTROL PROBE. A. W. Chesterman (to U. S. Atomic Energy Commission). U. S. Patent 2,878,287. Mar. 17, 1959.

A probe is described for intercepting a desired portion of a beam of charged particles and for indicating the spatial disposition of the beam. The disclosed probe assembly includes a pair of pivotally mounted vanes moveable into a single plane with adjacent edges joining and a calibrated mechanical arrangement for pivoting the vanes apart. When the probe is disposed in the path of a charged particle beam, the vanes may be adjusted according to the beam current received in each vane to ascertain the dimension of the beam.

15335

STRUCTURE FOR SUB-ASSEMBLIES OF ELECTRONIC EQUIPMENT. P. R. Bell and C. C. Harris (to U. S. Atomic Energy Commission). U. S. Patent 2,880,262. Mar. 31, 1959.

Sub-assemblies for electronic systems, particularly a unit which is self-contained and which may be adapted for quick application to and detachment from a chassis or panel, are discussed. The disclosed structure serves the dual purpose of a cover or enclosure for a subassembly comprising a base plate and also acts as a clamp for retaining the base plate in position on a chassis. The clamping action is provided by flexible fingers projecting from the side walls of the cover and extending through grooves in the base plate to engage with the opposite side of the chassis.

15336

PEAK LIMITING AMPLIFIER. W. W. Goldsworthy and J. B. Robinson (to U. S. Atomic Energy Commission). U. S. Patent 2,880,318. Mar. 31, 1959.

A peak voltage amplitude limiting system adapted for use with a cascade type amplifier is described. In its detailed aspects, the invention includes an amplifier having at least a first triode tube and a second triode tube, the cathode of the second tube being connected to the anode of the first tube. A peak limiter triode tube has its control grid coupled to the anode of the second tube and its anode connected to the cathode of the second tube. The operation of the limiter is controlled by a bias voltage source connected to the control grid of the limiter tube and the output of the system is taken from the anode of the second tube.

15337

VELOCITY INDICATOR FOR EXTRUSION PRESS. F. J. Digney, Jr. and F. Bevilacqua (to U. S. Atomic Energy Commission). U. S. Patent 2,881,391. Apr. 7, 1959.

An indicator is presented for measuring the low-speed velocity of an object in one direction where the object returns in the opposite direction at a high speed. The indicator comprises a drum having its axis of rotation transverse to the linear movement of the object and a tape wound upon the drum with its free end extending therefrom and adapted to be connected to the object. A constant torque is applied to the drum in a direction to wind the tape on the drum. The speed of the tape in the unwinding direction is indicated on a tachometer which is coupled through a shaft and clutch means to the drum only when the tape is unwinding.

15338

METHOD FOR STABILIZING KLYSTRONS. D. W. Magnuson and D. F. Smith (to U. S. Atomic Energy Commission). U. S. Patent 2,882,442. Apr. 14, 1959.

High-frequency oscillators for the generation of microwaves, particularly a system for stabilizing frequency-modulated klystron oscillators of the reflex type, are described. The system takes advantage of the fact that a change in oscillator frequency will alter the normal phase displacement between the cavity and its modulator, creating an error voltage which is utilized to regulate the frequency of the oscillator and stabilize it.

METALLURGY AND CERAMICS

15339 AERE-R-2898

United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.

THE DEFORMATION OF ALPHA URANIUM AT 450°C AND 500°C. B. R. Butcher. Apr. 1959. 17p.

Deformation tests on α uranium at 450°C have shown that the deformation element characteristics are very similar to those at room temperature. Similar tests at 500°C have revealed that twinning is much decreased, and that there is some evidence for pencil glide in a < 110 > direction. (auth)

15340 ANL-5966

Argonne National Lab., Lemont, Ill.

RECRYSTALLIZATION OF HEAVILY COLD-ROLLED URANIUM SHEET. W. R. Yario and L. T. Lloyd. May 1959. 40p. Contract W-31-109-eng-38. $1.25(OTS).

Changes in mean expansion coefficients upon annealing uranium sheet that had been rolled to 80% reduction in thickness at room temperature indicated that three different preferred orientations could be developed upon recrystallization. One preferred orientation, which is essentially the same as that of the as-rolled material, resulted from annealing for long times at 360°C or at a lower temperature; a second type was created by annealing for moderate times between 400 and 600°C; and the third accompanied grain coarsening at 650°C. The microstructures of the as-rolled and annealed specimens were extremely heterogeneous because of the large grain size present prior to final fabrication at room temperature. The as-rolled structures consisted of heavily deformed areas and smaller quantities of lightly deformed material. The annealing of the former was characterized by initial creation of very fine recrystallized grains which were absorbed later by discontinuous growth of larger grains. Lightly deformed areas, upon annealing, first exhibited recovery by polygonization and then underwent normal recrystallization. (auth)

15341 APEX-483

Purdue Univ., Lafayette, Ind.

STUDIES OF SOLID STATE REACTIONS IN HIGH TEMPERATURE ALLOY SYSTEMS. Quarterly Report No. 1 [on] NICKEL BASE ALLOY STUDIES. R. F. Radavich. Oct. 29, 1958. 16p. For General Electric Co. Aircraft Nuclear Propulsion Dept. Contracts AF33(600)-38062 and AT(11-1)-171. Subcontract CAAT-17. $0.50 (OTS).

Procedures for the study of matrix and oxidized surface of Ni–Cr alloys are described. Results of studies incorporating the use of these procedures on air melted and vacuum melted Ni–Cr alloys are included. Conclusions based on the results of these studies are presented. (auth)

15342 BAW-1072

Babcock and Wilcox Co. Research Center, Alliance, Ohio.

LIQUID METAL FUEL REACTOR EXPERIMENT. A GAS-SHIELDED CONSUMABLE-ELECTRODE ARC WELDING PROCESS FOR BUTT WELDING CROLOY 2-1/4 PIPING. R. M. Hargrove. Mar. 10, 1959. 40p. Contract AT(30-1)-1940. $6.30(ph), $3.00(mf) OTS.

The possibility of applying the gas-shielded consumable-electrode process to the automatic butt welding of Croloy $2\frac{1}{4}$ piping for eventual adaptation to remotely controlled operation was investigated. Satisfactory results have been obtained in horizontally fixed pipe when weld beads are started at the top (12 o'clock position) and ending at the bottom (6 o'clock position), alternating from side to side, and overlapping starts and stops. A mixture of helium and carbon dioxide gases with $\frac{3}{64}$-in. diameter wire has produced the best results. Difficulties encountered are maintenance of bead contour, arc stability, and satisfactory root penetration. Results show that a satisfactory technique can be developed. More work is required to design automatic welding equipment for remote-control. (auth)

15343 BMI-1301
Battelle Memorial Inst., Columbus, Ohio.
PROGRESS RELATING TO CIVILIAN APPLICATIONS DURING OCTOBER 1958. Russell W. Dayton and Clyde R. Tipton, Jr. Nov. 1, 1958. Decl. June 12, 1959. 58p. Contract W-7405-eng-92. $9.30(ph), $3.60(mf) OTS.

Thermal-conductivity and electrical-resistivity measurements were made on U−1.5 wt. % Zr, encapsulated in Zircaloy-2 with a NaK thermal bond. Data are presented on thermal conductivity measurements made on UO_2 specimens. A method of sink-float measurement to identify factors affecting irradiation-induced volume changes in graphite was continued. The stress-rupture and creep properties of 15% cold-worked Zircaloy-2 are being investigated in the 290 to 400°C temperature range in vacuum. High-purity single crystals of Mo are being prepared for irradiation-damage studies. A feasibility study of the neutron-activation method for the elemental analysis of portland cement was completed and preliminary experiments were initiated. The chemical analyses of irradiated and nonirradiated cetane, stearic acid, and the corresponding urea complexes were continued. A study of the mechanisms by which U solidifies in a cylindrical mold is being made. Coatings of Mo compounds on Croloy $2\frac{1}{4}$ were studied as potential protective coatings against liquid Bi. Work on the study of valence effects of oxide additions to UO_2 indicates that additions of Y_2O_3 are better stabilizers than La_2O_3 in 3000°F air. Measurements of hydrogen-absorption isotherms for the Zr−25 wt. % U alloy were made. An investigation was made of the effect of irradiation damage on the mechanical properties of type 347 stainless steel. Niobium−uranium alloys containing 20 to 70 wt. % U were prepared in small heats. A program aimed at improving the irradiation stability and corrosion resistance of Th−U alloys is being conducted. Fatigue studies of Inconel and INOR-8 are presented. A study of the kinetics and mechanism of the reaction of N_2 with Nb is presented. A study of the U−Nb constitutional diagram is being performed. Data are reported on the fabrication of fueled graphite spheres. Materials of construction for use in the various proposed processes for the recovery of spent reactor fuel elements are being evaluated. Titanium is being investigated for the Darex Process dissolver, Carpenter 20Cb, Ni-o-nel, and Illium 98 for Thorex and Sulfex solutions, and INOR-1 and INOR-8 for the fluoride-volatility processes. Properties of UC are being determined. The preparation of an initial series of Ta and Ta−W alloys for Pu-alloy compatibility evaluation is in progress. A study to determine the effect of neutron irradiation on the mechanical properties of Ta is reported. (For preceding period see BMI-1294.) (W.L.H.)

15344 BMI-1339
Battelle Memorial Inst., Columbus, Ohio.
PROPERTIES OF URANIUM DIOXIDE-STAINLESS STEEL DISPERSION FUEL PLATES. Stan J. Paprocki, Donald L. Keller, and Joseph M. Fackelmann. Apr. 28, 1959. 25p. $0.75(OTS).

The physical and mechanical properties of GCRE-type fuel elements were determined from room temperature to 1650°F. The fuel elements were prepared by cladding Type 318 stainless steel sheet to a core containing 15 to 35 wt. % UO_2 in either prealloyed Type 318 stainless steel or elemental iron-18 wt. % chromium-14 wt. % nickel-2.5 wt. % molybdenum. The tensile strength in the direction perpendicular to the rolling plane decreased from 24,600 psi at room temperature to 9,200 psi at 1650°F for the reference fuel plate, whose core contained 25 wt. % UO_2 in the elemental alloy. The tensile strength in the longitudinal direction for this fuel element ranged from 54,800 psi at room temperature to 14,200 psi at 1650°F, with elongation in 2 in. ranging from 8 to 13 per cent. The extrapolated stress for 1000-hr rupture life at 1650°F was 1800 psi, and a 1.4T bend was withstood without cracking. The mean linear thermal coefficient of expansion was 11.0×10^{-6} per °F for the range 68 to 1700°F. (auth)

15345 BW-5404
Babcock and Wilcox Co. Research and Development Dept., Alliance, Ohio.
TESTS ON THE PERMEABILITY OF THE COMPONENTS OF WATER THROUGH CLAD PLATE. William H. Moyer. Feb. 1, 1951. 19p. For Westinghouse Electric Corp. Atomic Power Div. Subcontract 14-302. $3.30(ph), $2.40(mf) OTS.

A description is given of an apparatus to measure the permeability of the components of water through thin metal sections at temperatures up to 650°F and a pressure of 2500 psi. Results are given for SA 212, AISI 347, and SA 212 clad with AISI 347. The clad plate used for these tests was AISI Type 347 on SA 212 by the Lukens method. (auth)

15346 CWR-4052
Curtiss-Wright Corp. Research Div., Quehanna, Penna.
CERAMOGRAPHIC STUDIES OF HOT-PRESSED BERYLLIA. W. C. Coons. Dec. 1958. 80p. $12.30 (ph), $4.50(mf) OTS.

Improvements have been made in the ceramographic techniques employed in the preparation of specimens of hot-pressed beryllia for microscopic study. Because of the transparency of highly polished BeO crystals it has been possible, by the utilization of an oil immersion objective and bright field illumination, to examine materials to at least 0.011 mm below the plane of polish. Studies of polished surfaces before and after exposure in an oxidizing atmosphere at temperatures up to 2600°F have revealed heretofore unobserved changes in microstructure in hot-pressed beryllia. As a result of these new observations it is envisioned that correlations eventually may be found between the microstructural changes and subsequently determined variations in mechanical properties of beryllia components. Examinations were made of a miscellaneous group of samples which included samples having variations in color and grain size from top to bottom, hot-pressed weld joints of two compacts welded together, and hot-pressed compacts containing additions of MgO. (auth)

15347 DMIC-111
Battelle Memorial Inst. Defense Metals Information Center, Columbus, Ohio.
THE PHYSICAL METALLURGY OF PRECIPITATION-HARDENABLE STAINLESS STEELS. D. C. Ludwigson and A. M. Hall. Apr. 20, 1959. 70p. Contract AF18 (600)-1375. (AD-214001; PB-151067).

The present knowledge on the physical metallurgy of precipitation-hardenable stainless steels is presented. The alloys discussed include the martensitic types (Stainless W and 17-4 PH), the semiaustenitic types (17-7 PH, PH 15-7 Mo, AM 350, and AM 355), and the austenitic types (A-286 and HNM). The areas of metallurgy common to most or all of these materials are discussed on the basis of classification by composition, austenite conditioning, the martensite reaction, and precipitation hardening. The application of metallurgical principles in the handling, heat treatment, and fabrication of these alloys is also discussed. (auth)

15348 DMIC-113
Battelle Memorial Inst. Defense Metals Information Center, Columbus, Ohio.
PROPERTIES OF CERTAIN COLD-ROLLED AUSTENITIC STAINLESS SHEET STEELS. R. J. Mangone, D. B. Roach, and A. M. Hall. May 15, 1959. 61p. Contract AF18(600)-1375. (AD-214845; PB-151069).

Certain austenitic stainless sheet steels, when cold rolled to the full-hard and extra-hard conditions, possess properties which are suitable for aircraft structural applications. This report provides available information on the properties of five such steels in the above conditions. These are the designations of the five steels: AISI 301, MicroMach, AISI 201, USS Tenelon, and USS 17-5MnV. (auth)

15349 DMIC-Memo-19
Battelle Memorial Inst., Defense Metals Information Center, Columbus, Ohio.
THE AVAILABILITY AND PROPERTIES OF RHENIUM. Daniel J. Maykuth. May 22, 1959. 11p.

A summary of the physical and mechanical properties of Re is given. Availability is also considered, and it is pointed out that Re production is limited. (J.R.D.)

15350 ISC-1144
Ames Lab., Ames, Iowa.
METALLURGICAL DEVELOPMENT FOR HANFORD PROGRAM. Semi-Annual Report [for] July 1 to December 31, 1958. Apr. 15, 1959. 27p. Contract W-7405-eng-82. $4.80(ph), $2.70(mf) OTS.

A study of some high-temperature transport properties of Ta and Ag is reported in which data are given on electric conductivity, thermal diffusivity, Seebeck coefficient, and thermal conductivity vs. temperature. Preliminary measurements of the specific heat of crystal-bar Th are given and discussed. The reaction between Yt and H_2O vapor at 725 to 800°C and water pressures of 72, 79, and 118 mm Hg was investigated gravimetrically. (T.R.H.)

15351 ISC-1155
Ames Lab., Ames, Iowa.
TABULATION, BIBLIOGRAPHY, AND STRUCTURE OF BINARY INTERMETALLIC COMPOUNDS. V. COMPOUNDS OF ALUMINUM AND INDIUM. A. E. Ray, J. A. Kingston, and J. F. Smith. Apr. 23, 1959. 41p. Contract W-7405-eng-82. $1.25(OTS).

15352 MAB-139-M-F1
National Research Council. Materials Advisory Board.
FIRST PROGRESS REPORT BY THE PANEL ON FORGINGS AND EXTRUSIONS OF THE MATERIALS ADVISORY BOARD COMMITTEE ON THE DEVELOPMENT OF MANUFACTURING PROCESSES FOR AIRCRAFT MATERIALS (AMC). June 1, 1959. 26p. Contract DA-36-039-sc-76436.

A general review is presented of the purposes, objectives, progress, and accomplishments on extrusion, and forging of aircraft materials under contract and those proposed for future contracts. (J.E.D.)

15353 MND-DB-2525
Martin Co. Nuclear Div., Baltimore.
DEVELOPMENT OF IRON-ALUMINUM BASE ALLOY FOR GAS COOLED REACTOR COMPONENTS. Final Report. Frank Tate. Apr. 1959. 139p. Contract AT(30-3)-325. $2.75 OTS.

The primary aim of this program was to develop an iron-aluminum base alloy for cladding gas cooled reactor core components. Secondary aims were to gain knowledge of fuel element fabricability, radiation effects and acid solubility of iron-aluminum base alloys. Specifically, the alloy to be developed was to have nominal creep strength at 1600°F while maintaining the oxidation resistance and room temperature ductility of the Martin Nuclear alloy, DB-2. The following criteria that the optimum alloy should meet were as follows: maximum creep rate of one percent per 10,000 hours at 1600°F with a 500 psi stress; maximum of four mils penetration per year in air oxidation at 1600°F; and minimum room temperature ductility of 10% tensile elongation. During the development of the alloy, investigations were carried out on the hot roll bonding of the alloys to themselves, fabrication of fuel element core matrix materials, brazing of the alloys, effects of radiation on the alloys and the solubility of the materials in acids which are used in reprocessing spent fuel elements. (auth)

15354 NAA-SR-2969
Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.
ANNEALING EFFECTS IN THORIUM–URANIUM ALLOYS. G. G. Bentle. June 1, 1959. 19p. Contract AT-11-1-GEN-8. $0.75(OTS).

Microstructural changes were studied metallographically on long-time annealing of unirradiated thorium alloys containing up to 10 wt. % uranium. These changes, an agglomeration of the uranium phase and grain growth, were predicted to have little effect on the irradiation stability. (auth)

15355 NAA-SR-3169
Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.
URANIUM ALLOY DEVELOPMENT PROGRAM FOR OMR. W. H. Friske, H. E. Kline, and M. H. Binstock. May 1, 1959. 51p. Contract AT-11-1-GEN-8. $1.50 (OTS).

The mechanical and metallurgical properties of four potential fuel alloys for Organic Moderated Reactors were determined. The alloys evaluated were uranium-3.5 molybdenum, uranium-3.5 molybdenum-0.5 silicon, uranium-3.5 molybdenum-0.5 aluminum, and uranium-2 zirconium-0.1 aluminum. Of these, the uranium-molybdenum and uranium-molybdenum-silicon alloys were selected as the reference alloys for two OMR-type fuel elements, and are being tested in OMRE. (auth)

15356 NAA-SR-3625
Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.
PROPERTIES OF URANIUM MONOCARBIDE. C. A. Smith and Frank Rough. June 1, 1959. 17p. Contract AT-11-1-GEN-8. $0.75(OTS).

Massive specimens of UC were prepared by arc melting and drop casting. Physical property measurements of the unirradiated material included hardness, density, electrical resistivity, thermal conductivity, linear expansion, modulus of elasticity, and compatibility with NaK and stainless steel. One group of specimens was irradiated in the MTR to a burnup of 1400 Mwd/ton. Swelling was found to be in the range of 0.66 to 2.53%. Fission recoil from the surface of the specimens could account for the observed gas release. (auth)

15357 NACA-RM-E57K22a
Lewis Flight Propulsion Lab., Cleveland.
ELEVATED-TEMPERATURE COMBINED STRESS-RUPTURE PLUS FATIGUE STRENTH OF WASPALOY HAVING DIFFERENT AGING TREATMENTS AND/OR MOLYBDENUM CONTENTS. C. A. Hoffman and M. B. Hornak. Feb. 25, 1958. 21p. (AD-153282).

Waspaloy was studied (at 1500°F) to determine if stress-rupture ductilities and notch sensitivities associated with given aging treatments and/or molybdenum contents could be correlated with respective combined stress-rupture plus fatigue strengths. A possible relation between stress-rupture ductility and combined stress-rupture plus fatigue strength was indicated. No clear relation was found between notch-rupture strength and combined stress-rupture plus fatigue strength. If heat treatment and/or composition alone are considered, results indicate that double aging could improve combined stress strength and that double aging plus increased molybdenum content could cause a further increase in combined stress strength of Waspaloy. (auth)

15358 NACA-TN-3987
Lewis Flight Propulsion Lab., Cleveland.
EFFECT OF ENVIRONMENTS OF SODIUM HYDROXIDE AIR, AND ARGON ON THE STRESS-RUPTURE PROPERTIES OF NICKEL AT 1500°F. Howard T. McHenry and H. B. Probst. Jan. 1958. 23p. (AD-150803).

Stress-rupture lives of nickel tubes both containing sodium hydroxide and devoid of sodium hydroxide were determined for testing environments of argon and air. Sodium hydroxide had no effect on the strength of nickel in argon. Severe intergranular and surface oxidation of nickel tubes tested in air increased their rupture strength over that of similar specimens tested in argon. This strengthening was partly lost when the tubes contained sodium hydroxide. (auth)

15359 NASA-M-6-2-59L
Langley Aeronautical Lab., Langley Field, Va.
COMPRESSIVE STRENGTH OF STAINLESS-STEEL SANDWICHES AT ELEVATED TEMPERATURES. Eldon E. Mathauser and Richard A. Pride. June 1959. 50p.

Experimental results are presented from crippling tests of specimens in the temperature range from 80 to 1,200°F. The specimens included resistance-welded 17-7 PH stainless-steel sandwiches with single-corrugated cores, type 301 stainless-steel sandwiches with double-corrugated cores, and brazed 17-7 PH stainless-steel sandwiches with honeycomb cores. The experimental strengths are compared with predicted buckling and crippling strengths. Photographs of some of the tested specimens are included to show the modes of failure. (auth)

15360 NMI-4373
Nuclear Metals, Inc., Concord, Mass.
EVALUATION OF ZIRCALOY-CLAD U−2 w/o Zr ALLOY TUBE NO. 31, EXTRUSION NO. 18391. D. F. Kaufman and R. G. Jenkins. Jan. 12, 1959. 37p. Contract AT(30-1)-1565, Sponsor Agreement No. S-31. $6.30(ph), $3.00(mf) OTS.

The detailed and summary data obtained in the evaluation of Tube No. 31, Extrusion No. 18391 are reported. This tube is one of a lot of nine tubes fabricated to provide test material for irradiation in the Chalk River−NRU reactor. The evaluation data are presented primarily in the form of tables; Table 1 is a key to the location of all tabulated data. (auth)

15361 NP-7586
Brush Beryllium Co., Cleveland.
DEVELOPMENT OF WROUGHT BERYLLIUM ALLOYS OF IMPROVED PROPERTIES. Progress Report No. 6 [for] January 1, 1959 to March 31, 1959. Technical Report No. 152. J. G. Klein, L. M. Perelman, and W. W. Beaver. Mar. 31, 1959. 25p. Project No. 7(8-7351). USAF Delivery Order 33(616)-57-19, Task No. 73517.

A full metallurgical evaluation of beryllium of higher than normal oxide content as well as beryllium fabricated from subsieve-size powder is under way. Mechanical and physical properties are reported for rod and sheet wrought from high-oxide metal. The results of preliminary studies of beryllium-rich silver alloys are described. (For preceding period see NP-7363.) (auth)

15362 NP-7589
Narmco Industries Inc., San Diego, Calif.
DEVELOPMENT OF EXO-REACTANT INORGANIC ADHESIVE SYSTEM. Quarterly Progress Report No. 3 Covering period January 1−March 31, 1959. William Bassett and Roger A. Long. Apr. 1, 1959. 20p. Contract NOas-58-857-c.

Three approaches were used in the preliminary evaluation to determine applicability of a number of metal-ceramic compositions to adhesive bonding by exothermic heating. Initially the reaction products of a number of exothermic systems were compacted without utilizing a reaction and the compacts heated to 2700°F. After cooling, their characteristics were observed. The more promising systems were then prepared by reacting metal-metal oxide components and the characteristics of the reactions as well as the resultant products were recorded. Four promising systems resulted from this initial screening and attempts were made to use these systems to bond stainless steel lap shear specimens. No bonds were produced since the quantity of exotherm used was not sufficient to give a reaction. However, lap shear strengths of up to 1000 psi at room temperature were obtained with an exotherm system which produced a ceramic glassy type adhesive. The shear strengths obtained served to demonstrate the plausibility of the proposed bonding technique. (auth)

15363 NP-7630
Westinghouse Electric Corp. Research Labs., Pittsburgh.
RESEARCH AND DEVELOPMENT IN HIGH STRENGTH HEAT RESISTANT ALLOYS. Interim Report No. 2 [for] August 27, 1958 through October 26, 1958. L. L. France. Oct. 31, 1958. 14p. Contract NOas-58852-C.

Non-consumable arc melted buttons of alloys in the binary systems Ta−Hf, Ta−W, and W−Hf were prepared. Preliminary microstructural observations and hardness determinations indicate that Ta alloys with up to 20 at. % Hf are single phase and forgeable at 1150°C. Work was continued on modification of the levitation melting equipment, and Ta and Ta-Hf alloys were successfully levitated and melted. Tungsten was levitated and heated to about 3200°C but was melted. A literature survey which is limited to the alloys of immediate interest is included. (auth)

15364 NP-7635
Case Inst. of Tech., Cleveland.
THE EFFECT OF SECOND PHASES ON THE MECHANICAL PROPERTIES OF ALLOYS. Technical Report No. 2 [on] AN INVESTIGATION OF THE FRAC-

TURE OF METALS. B. I. Edelson and W. M. Baldwin, Jr. May 1959. 58p. Contract Nonr-1141(04).

Tensile test data were determined for two-phase copper-base alloys fabricated synthetically by powder metallurgical methods with various second phase particles including metals, non-metals, and voids with a twenty-fold range in particle size in some series and with volume fractions ranging as high as 0.24. Only those second phase particles which developed a strong particle-matrix bond strengthened the alloys and in those cases yield stress σ depended upon mean free path λ between particles. The Gensamer relationship, $\sigma = -A \log \lambda + B$, was followed only within certain limits of mean free path. All second phase particles as well as voids were found to embrittle the alloys in a manner which depended upon volume fraction of second phase only and which was independent of particle size, shape, and composition. It was hypothesized that second phases are embrittling because they serve to concentrate strain (not stress) along slip lines (in the sense of the theory of plasticity) wherein the metal reaches its fracture strain at a low external average strain. This rationalization finds support in the fact that the curves for ductility vs. the volume fraction of second phase are quite similar to the curves for ductility vs. the fractional area removed in notch tensile tests. Strain hardening exponent and fracture stress behaved in a similar fashion to ductility. (auth)

15365 NP-7654
Virginia. Univ., Charlottesville. Ordnance Research Lab.
RESEARCH AND INVESTIGATIONS RELATIVE TO THE ELECTRODEPOSITION OF CHROMIUM PLATE ON STEEL. Quarterly Progress Report for the Period February 20, 1959 to May 19, 1959. William H. Dancy, Jr. June 1, 1959. 13p. Contract DA-36-034-504-ORD-12RD. (UVA/ORL-504-12RD-59-QPR-2).

Investigation of the effects of changing the chromate-sulfate ratio on adhesion of Cr on steel is continuing. Sets of steel specimens were plated using reagent grade CrO_3 and distilled water in the concentrations of 200 and 300 g/l. The procedure is given, and data for the adhesion afforded by each of the plating conditions are tabulated. Also values of adhesion as a function of sulfate concentration are plotted as well as plating rates as a function of various concentrations. (J.R.D.)

15366 SCNC-266
Sylvania-Corning Nuclear Corp., Bayside, N. Y.
DISPERSION-TYPE MATERIALS FOR FUEL ELEMENTS. PART I. URANIUM MONONITRIDE AND URANIUM SILICIDE DISPERSION MATERIALS.
I. Sheinhartz and J. L. Zambrow. June 1958. Decl. Mar. 20, 1959. 19p. Contract AT-30-1-GEN-366. \$3.30(ph), \$2.40(mf) OTS.

The basic requirements for dispersion-type fuel elements and the basis for the selection of the components, i.e., melting temperature, density, and uranium-content of the uranium compounds, and melting temperature and absorption cross section of the matrix materials are described. Two types of dispersions are investigated: uranium nitride and uranium silicide. Their reactions with Zircaloy-2 and other matrix materials, such as molybdenum, niobium, Nichrome-V, Ti–Nb alloys, or vanadium, are shown in some characteristic photomicrographs. The corrosion rate of some of these dispersion-type materials in 600°C water is briefly discussed. (auth)

15367 TAM-147
Illinois. Univ., Urbana.
ELEVATED TEMPERATURE TENSILE AND FATIGUE BEHAVIOR OF UNALLOYED ARC-CAST MOLYBDENUM. Period Covered: April 1957 to October 1958. G. W. Brock and G. M. Sinclair. Feb. 1959. 30p. Project No. 7024. Contract AF33(616)-5153. (WADC-TN-59-59; AD-210837).

Tension and fatigue tests were carried out over a range of temperatures to explore the possible effects of interaction between interstitial atoms and dislocations on fatigue behavior of recrystallized molybdenum containing small amounts of interstitial elements. No increase in tensile strength corresponding to that found in the "blue brittle" range in steel was observed as the test temperatures were raised over the range −300 to 1800°F. However, values of the upper and lower yield point remain essentially unchanged over the temperature range 200 to 400°F. The presence of a "knee" in the fatigue S-log N diagram over the temperature range, 75 to 875°F, suggests that strain aging may be influencing the fatigue behavior in this temperature range and may also be responsible for the high values of fatigue ratio (0.65–0.72) observed at these temperatures. The appearance of a sharp "knee" in the S-N diagram is particularly pronounced at 675°F. (auth)

15368 WADC-TR-58-615(Pt. I)
A COMPENDIUM OF CONSTITUTIONAL TERNARY DIAGRAMS OF THE METALLIC SYSTEMS.
W. Guertler. Dec. 22, 1958. 257p. Project title: METALLIC MATERIALS. Task title: HIGH TEMPERATURE ALLOYS. Contract AF61(052)-74. (AD-210719).

Title in English, with text in German. OTS.

The presentation of a complete collection of ternary phase diagrams of the various metallic systems. The ternary diagrams presented are built from available binary diagrams. In each instance the most reliable binary diagram has been selected. (auth)

15369 WADC-TR-58-640
Massachusetts Inst. of Tech., Cambridge.
FINE PARTICLE STRENGTHENING FOR HIGH TEMPERATURE USE. Walter Schwarzkopf and Nicholas J. Grant. Dec. 1958. 16p. Project title: SOLID STATE RESEARCH. Task title: INTERACTIONS: IMPERFECTIONS, AND ALLOY THEORY. Contract AF33(616)-5424. (AD-212312).

Various methods of achieving a fine dispersion of a hard insoluble particle in a pure metal or low alloy matrix are reviewed. Comparison is made among the systems on the basis of the ratio of the test temperature to the absolute melting temperature. The promise offered by internal oxidation of dilute solutions in which the solute element forms a stable refractory oxide is illustrated by recent work with nickel–aluminum solid solutions, with testing of the alloys at 816°C (1500°F). (auth)

15370 WAPD-A1W(NRM)-214
Westinghouse Electric Co. Bettis Plant, Pittsburgh.
LITERATURE SURVEY ON SELECTED ALLOYS CONTAINING METALLIC POISONS. A. B. Thomas, D. G. Freas, and E. S. Byron. June 1958. Decl. Mar. 24, 1959. 35p. Contract AT-11-1-GEN-14. \$6.30(ph), \$3.00(mf) OTS.

A literature search was made for information on metallic elements suitable for use as burnable poisons. The search was concerned primarily with availability, cost, alloy preparation and fabrication, phase diagrams, and corrosion resistance. The alloy systems are arranged in alphabetical order. (A.C.)

15371 WAPD-FE-1028
Westinghouse Electric Co. Atomic Power Div., Pittsburgh.
THE EFFECT OF FABRICATION VARIATIONS ON SOME MECHANICAL PROPERTIES AND FAILURE CHARACTERISTICS OF ZIRCALOY-2 TUBING. L. F. Cochrun. Sept. 16, 1955. 16p. $3.30(ph), $2.40(mf) OTS.

A determination was made of the effect of both minor fabrication variations and completely different processes on some properties and failure characteristics of tubing of a given size and range of residual cold work. The major processes are concerned with the basic method of fabrication. The minor changes are concerned with such refinements as method of straightening, annealing temperatures, and method of mandrel removal. (J.E.D.)

15372 WAPD-ZH-17
Westinghouse Electric Corp. Bettis Plant, Pittsburgh.
ZIRCONIUM HIGHLIGHTS. May 1959. 21p. $3.30(ph), $2.40(mf) OTS.

The following reports on the technology of zirconium are presented: hardness of Zircaloy-2 with varying oxygen, hydrogen in zirconium, habit plane for hydride precipitation in zirconium and uranium–zirconium, effect of iron contamination on the corrosion resistance of Zircaloy-2, and effects of rocking and drawing reductions on grain size of Zircaloy-2 tubing. (J.E.D.)

15373 WCLT-TM-58-139
Wright Air Development Center. Materials Lab., Wright-Patterson AFB, Ohio.
SUMMARY OF FIRST HIGH TEMPERATURE INORGANIC REFRACTORY COATINGS WORKING GROUP MEETING HELD JOINTLY BY WADC AND THE UNIVERSITY OF DAYTON ON OCTOBER 28 AND 29, 1958. David Roller. Dec. 5, 1958. 83p. Project No. 7312.

A detailed summary of the reports and discussion in the area of high-temperature inorganic refractory coatings presented at the Univ. of Dayton, October 28 and 29, 1958, is outlined. (J.E.D.)

15374 HW-tr-4
URANIUM ALLOYS OF HIGH ALLOYING CONTENT. G. Cabane. Translated by Liz Appleby (Hanford Atomic Products Operation) from Metaux Corrosion–Inds. 34, 49-57(1959). 19p. $4.80(ph), $2.70(mf) JCL.

A study was made of the alloys of uranium which can withstand temperatures of 600 to 800°C over long periods of irradiation. Results indicate that the alloys molybdenum–uranium and niobium–uranium may offer the possibility of a fuel with a homogeneous metallic system which is a good conductor and can withstand elevated temperatures under advantageous irradiation rates. (J.E.D.)

15375
EXAMINING CONTINUOUS STEEL CASTINGS. C. Varga and J. Fodor (Csepel Works, Hungary). Atomic World 10, 142-3(1959) Apr.

In continuous casting molten metal is poured into a mold on a tower, the solidifying metal ingot passes down through cooling zones until the final product is completely solid. A method of determining the lowest point where the metal is molten by dropping a radioactive W ball into the casting is described. (J.R.D.)

15376
CONTRIBUTION TO THE STUDY OF STRESS CORROSION OF AUSTENITE STEEL OF THE 18/8 TYPE. Joseph Hochmann. Compt. rend. 248, 2999-3000(1959) May 25. (In French)

Sheets of 18/8 stainless steel, which had been etched, polished, or sand blasted, were submitted to stress corrosion in a boiling solution containing 42% magnesium chloride. The polished and etched samples broke after a time varying between 2 and 24 hr. The sand-blasted samples showed no cracking after 150 hr, the duration of the tests. Two hypotheses are advanced to explain the effect of the sand blasting on the corrosion resistance. (J.S.R.)

15377
THE X-RAY STUDY OF THE FINE STRUCTURE OF GROUND POWDERED NICKEL. Adéla Kochanovska (Czechoslovak Academy of Sciences, Prague). Czechoslov. J. Phys. 7, 455-67(1957). (In Czech.)

A study was made of the changes in the fine structure caused by grinding powdered nickel of great purity obtained from nickel oxide by reduction in a hydrogen atmosphere and annealing. It is shown that the curves depicting the course of the widths, intensities, and positions of diffraction lines as a function of grinding time mutually correspond; the increase in the width of the diffraction lines corresponds to the decrease in their integral intensities and lessening of the inter-planar distances, where the limiting values, i.e., the maximum of the width, the minimum of the intensity, and minimum values of the inter-planar distances together with the maximum of plastic anisotropy are obtained conformably for the same duration of the grinding process (16 hours). It is shown that during the long-period grinding process partial self-recovery of this material takes place. The cause of the decrease in inter-planar distances, which was found in the first phase of the grinding process (instead of the increase expected according to theory), should probably be sought in the residual hydrogen which is located interstitially in the lattice and which in the course of the plastic deformation, accompanied during the grinding process by an increase in temperature, is eliminated from the lattice. (auth)

15378
EFFECT OF A PRELIMINARY DEFORMATION ON THE PLASTICITY OF ALUMINUM. V. D. Kuznetsov and A. I. Loskutov (Kuibyshev Tomsk State Univ.). Doklady Akad. Nauk S.S.S.R. 126, 70-3(1959) May 1. (In Russian)

The reversible structural defects in deformed Al were studied in order to determine the effects of deformation followed by annealing on the relative expansion σ and tensile strength σ_B. The effects of temperature on the plasticity and strength of the specimens were studied at 20, 100, 150, 275, and 330°C with continuous deformation of 6, 10, 14, 18, 20, and 25% followed by annealing at 400°C. The experiments showed that the expansion produces some structural defects affecting the plasticity of the material. Annealing does not eliminate the defects. (R.V.J.)

15379
SELECTION OF THE PROCEDURE FOR THE INDUSTRIAL PREPARATION OF URANIUM METAL. P. Vertès (Commissariat a l'Énergie Atomique, Bouchet, France). Énergie nucléaire 1, 43-6(1959) Jan.–Apr. (In French)

The selection of a procedure for the industrial production of uranium is influenced by the quality of metal desired, present and future importance of the industrial production, raw materials available, and the economic and technical conditions. A general survey is made of the various common techniques. The chemical flowsheet, the selection of apparatus, and the raw materials are considered. (J.S.R.)

15380

MAGNETOSTRICTION AND MAGNETIZATION OF Fe–Ni–Co ALLOYS WITH IRON–NICKEL AND IRON–COBALT BASE. S. I. Voskoboinikov (Moscow Inst. of Transportation). Fiz. Metal. i Metalloved. 6, 1011-16 (1959). (In Russian)

Measurements were made of the longitudinal and transverse magnetostriction and magnetization in the various sections of the Co–Fe–Ni alloy constitution diagrams. Descriptions are given of a special high-sensitivity, optico-mechanical installation developed for measuring magnetostrictions. (R.V.J.)

15381

ON THE ANOMALOUS ELECTRIC CONDUCTIVITY OF Ni_3Cr. N. V. Semenova. Fiz. Metal. i Metalloved. 6, 1017-26(1958). (In Russian)

The microstructure, volume alterations, lattice period, thermo-electromotive forces, and hardness of Nichrome alloys of various thermal treatments were studied in order to determine the anomalous changes in the electric resistance of the alloys. The data obtained show that the structural process appearing in the binary Ni_3Cr alloy and ternary $Ni_3(Cr,Mo)$ and $Ni_3(Cr,V)$ alloys at 400 to 500°C are followed by an increase in electric resistance, volume changes, and an increase of thermo-electromotive forces which leads to the assumption that this structural process is an atomic ordering not yet investigated in the transition group elements. (R.V.J.)

15382

EFFECTS OF CHROMIUM ON THE HARDENING AND SOFTENING OF NICKEL. M. P. Arbuzov and M. P. Krulikovskaya (Inst. of Metal Physics, Academy of Sciences, Ukrainian, S.S.R.). Fiz. Metal. i Metalloved. 6, 1070-6(1958). (In Russian)

Studies were made of the changes in the fine crystalline structure and hardness of chromium–nickel alloys in the hardened state and during heat-softening. The effects of Cr on the hardening and weakening processes were analyzed as well as the relation between the fine crystalline structure and hardness of alloys. (R.V.J.)

15383

EFFECTS OF Mn AND Mo ON THE C SOLUBILITY IN α IRON AND THE KINETICS OF C SEPARATION IN PRESENCE OF Mn AND Mo. S. N. Polyakov and K. F. Starodubov (Inst. of Ferrous Metallurgy, Academy of Sciences, Ukrainian, S.S.R.). Fiz. Metal. i Metalloved. 6, 1110-21(1958). (In Russian)

The effects of Mn and Mo on the solubility of C in α iron were studied by internal friction methods. Diagrams of limited solubility of C at 720 to 750°C are plotted. (R.V.J.)

15384

STRUCTURAL CHANGES IN 20KhM–L STEEL IN CONTINUOUS THERMAL TREATMENT. S. S. Dyachenko, L. S. Palatnik, R. S. Kaplan, S. I. German, and N. I. Butko (Lenin Khar'kov Polytechnic Inst.). Fiz. Metal. i Metalloved. 6, 1122-9(1958). (In Russian)

Metallographic, x-ray, and electron microscopic studies were made of 20 KhM–L steel (0.15% C, 0.5% Cr, 0.61% Mn, 0.55% Mo) after continuous thermal treatment in loaded and normal states. The mixture of three carbides with structure of $Cr_{23}C_6$, Mo_2C, and Fe_2Mo_2C was observed in the carbide precipitant after normalization and tempering at 650 to 680°C. Carbide coalescence takes place at 500 to 550°C during which carbide-free ferrite zones form at the perlite grain boundaries. The enrichment of the α phase by alloying elements due to molybdenum carbide solubility improves the thermal resistance of manufactured wares. (R.V.J.)

15385

STRUCTURE OF THE NEW DEFORMED MAGNETICALLY HARDENED ALLOYS. M. N. Raevskaya. Izvest. Akad. Nauk S.S.S.R., Ser. Fiz. 23, 266-70(1959) Mar. (In Russian)

The microstructure and properties of magnetically hardened alloys were studied with diffusion hardened and $\gamma-\alpha$ transition type alloys. An x-ray analysis and electron-microscope pictures were made for isotropic specimens of Al–Fe–Nb–Ni (25% Ni and 9% Al alloyed with additional Nb) and anisotropic thermomagnetically treated specimens of Al–Co–Fe–Nb–Ni (7% Al, 3% Co, 4% Nb, and 14% Ni, and 9% Al, 18% Co, 4% Nb, and 16% Ni). The properties and structure of Fe–Mn–Ni base alloys were studied with specimens with 12% Mn, 3% Mo, and 3% Ni after 90% compression deformation and tempering at various temperatures. (R.V.J.)

15386

EFFECTS OF HIGH-TEMPERATURE ANNEALING ON MAGNETIC PROPERTIES OF SOFT MAGNETIC ALLOYS. N. I. Lapkin and V. S. Meskin. Izvest. Akad Nauk S.S.S.R., Ser. Fiz. 23, 280-4(1959) Mar. (In Russian)

The effects of high-temperature annealing on the magnetic properties of iron–nickel, 50% Permalloy, and molybdenum Permalloy were investigated at identical temperatures but in various media. (R.V.J.)

15387

FERROMAGNETISM OF Mn–B ALLOYS. N. Z. Miryasov and A. P. Parsanov (Lomonosov Moscow State Univ.). Izvest. Akad. Nauk S.S.S.R., Ser. Fiz. 23, 285-8(1959) Mar. (In Russian)

The dependence of spontaneous magnetization σ_0 and Curie point θ of prepared Mn–B systems (with 99.8% pure Mn and 99.3% B) and the conditions of ferromagnetization in the systems were studied. The order of accuracy of σ for most samples was 0.7 to 0.4% and for specimens with low magnetization was up to ±2.0%. Tests were carried out with 20 alloys containing from 5 to 52.7% B. Ferromagnetism appeared in specimens with over 33% B, when the phase MnB begins to separate; the spontaneous ferromagnetism reaches a maximum for the pure MnB phase and is equal to 140 ± 1 Gs cm^3/g. The mean atomic moment is 1.65 μ_B. The B_S saturation induction for MnB at room temperature (measured at 6.45 g cm^{-3} density) and at 0°K is given. (R.V.J.)

15388

INVESTIGATIONS OF $NiO-ZnO-Fe_2O_3$ SYSTEMS. K. A. Piskarev. Izvest. Akad. Nauk S.S.S.R., Ser. Fiz. 23, 289-303(1959) Mar. (In Russian)

The phase composition of $NiO-ZnO-F_2O_3$ systems and their solubilities in stoichiometric Ni–Zn ferrites were determined on the basis of x-ray analysis and the regularities in Curie point variations. Ring-shaped specimens of $NiO-ZnO-Fe_2O_3$ were sintered at temperatures of 1110, 1240, 1320, 1375, and 1420°C, and cooled down to 1100°C at 100° per hour, 1100 to 900°C at 80° per hour, 900 to 500°C at 40° per hour, and 500 to 200°C at 20° per hour. At 200° the specimens were taken out of the furnace. Constitution diagrams of the tests are included. (R.V.J.)

15389

PROPERTIES OF SOLID SOLUTIONS OF $NiFe_2O_4$–$MgFe_2O_4$. N. A. Smol'kov and Yu. P. Simanov (Lomonosov Moscow State Univ.). Izvest. Akad. Nauk S.S.S.R., Ser. Fiz. 23, 307-10(1959) Mar. (In Russian)

The structure and magnetic and high-frequency properties of stoichiometric nickel and magnesium ferrites were studied with specimens prepared from oxides by sintering at 1300°C for 3 hours. (R.V.J.)

15390

DISPERSION PENETRABILITY AND ABSORPTION OF Mn–Zn FERRITES (DISPERSION OF ELEMENTS). PART I. L. A. Fomenko. Izvest. Akad. Nauk S.S.S.R., Ser. Fiz. 23, 329-35(1959) Mar. (In Russian)

Magnetic spectra of non-metallized and metallized cores of Mn–Zn ferrites were studied with various size specimens. It is shown that the spectra can be described by two dispersion mechanisms: element dispersion and material dispersion. The volume resonance is considered to be the basic mechanism responsible for the changes in spectra. (R.V.J.)

15391

DISPERSION PENETRABILITY AND ABSORPTION IN Mn–Zn FERRITES. II. DISPERSION OF THE MATERIAL. L. A. Fomenko. Izvest. Akad. Nauk S.S.S.R., Ser. Fiz. 23, 336-42(1959) Mar. (In Russian)

The penetrability of ferrite specimens was studied. The data obtained indicated a certain disagreement with theoretical data. The data showed a negligible macroscopic anisotropy of Mn–Zn ferrite electrical properties and the relative similarity of magnetic and electric penetrability, obtained with identical composition and technology. Formulas were derived for calculating the element spectra for ferrite cores with rectangular cross section and for the volume resonance frequency. (R.V.J.)

15392

FERRITE PROPERTIES IN PULSE INSTALLATIONS. N. A. Smol'kov and V. F. Belov (Lomonosov Moscow State Univ.). Izvest. Akad. Nauk S.S.S.R., Ser. Fiz. 23, 357-60(1959) Mar. (In Russian)

The temperature dependence of Mg–Mn ferrite pulse characteristics and the temperature effects on the hysteresis loop were investigated. (R.V.J.)

15393

FERROMAGNETIC SEMICONDUCTORS IN SUPER-FREQUENCY FIELDS. A. G. Gurevich. Izvest. Akad. Nauk S.S.S.R., Ser. Fiz. 23, 361-71(1959) Mar. (In Russian)

A review is presented of ferromagnetic properties of semiconductors in super-high-frequency fields. Special attention was given to magnetic materials. 76 references. (R.V.J.)

15394

ABOUT THE NEW HIGH-CONSTRICTION ALLOYS OF Fe–Pt, Fe–Pd, AND Ni–Pd SYSTEMS. Z. I. Alizade (Azerbaidzhan Polytechnic Inst.). Izvest. Akad. Nauk S.S.S.R., Ser. Fiz. 23, 416-17(1959) Mar. (In Russian)

The magnetostriction of Fe–Pd, Fe–Pt, and Ni–Pd in a wide range of Pd and Pt concentrations in Fe and Pd in Ni was studied with 26 specimens homogenized in vacuum at 1150°C for 12 hours and cooled to room temperature at 250°C per minute. The measurements of magnetostriction were of a precision order of 3 to 5%. It was found that the binary compositions follow a series of alloys with maximum positive (Fe–Pt and Fe–Pd) and negative (Ni–Pd) saturation striction. (R.V.J.)

15395

EXPERIMENTAL INVESTIGATION INTO THE STRESS DISTRIBUTION IN A BAND-REINFORCED PRESSURE VESSEL. K. G. Mantle, N. Marshall, and P. J. Palmer (John Thompson, Ltd., Wolverhampton, Eng.). J. Brit. Nuclear Energy Conf. 4, 165-76(1959) Apr.

A model of a band-reinforced, cylindrical, reactor pressure vessel has been manufactured and tested. The vessel dimensions were 5 ft inside diam by 9 ft over-all length, with hemispherical ends, nominal plate thickness being 1 in. throughout. Hoop reinforcement on the barrel consisted of 3 in. wide circumferential bands, each band being built up of 13 layers of $\frac{1}{8}$ in. strip, giving a total band thickness of $1\frac{5}{8}$ in. Full details of design, construction, and method of manufacture are given. A complete experimental investigation into the stress distribution in the vessel has been carried out, using electrical resistance strain gages, both at its design pressure of 1000 lb/in^2 and also at twice this pressure. The stress distribution on the inner surface of the barrel, on the outer surface of the bands, and local to the tangent line has been measured. These results are compared with theoretical calculations. Finally, the vessel was pressurized to destruction. The results show that, as would be expected, the band reinforcement was not fully effective. However, the general stress level was maintained within acceptable limits, the theoretical stresses being exceeded by about 20%. The bursting pressure of 3940 lb/in.^{2} confirms the safety of the design, that is, a design factor of safety of 3.94. It is considered that the results of the investigation fully demonstrate the safety and merits of the design. (auth)

15396

THE STRUCTURE OF BERYLLIUM, WITH PARTICULAR REFERENCE TO TEMPERATURES ABOVE 1200°C. A. J. Martin and A. Moore (Atomic Weapons Research Establishment, Aldermaston, Berks, Eng.). J. Less-Common Metals 1, 85-93(1959) Apr.

Research was conducted at Atomic Weapons Research Establishment to investigate the conflicting reports concerning the modifications of Be and to study the effect of purity on solid state changes. Electrical resistance measurements, thermal analysis, and x-ray lattice parameter measurements were used. The measurements were carried out at temperatures of −196 to 1290°C. The data obtained in the latter two measurements, particularly those above 1200°C, are of particular interest. Results are presented tabularly and graphically in addition to phase diagrams and x-ray-diffraction spectra. (J.R.D.)

15397

SOME INTERESTING PROPERTIES OF PYROLYTIC CARBON. I. THE STRUCTURE AND DENSITY OF PYROLYTIC CARBON. A. R. G. Brown, D. Clark, and J. Eastabrook. II. DEFORMATION OF DEPOSITED CARBON. F. J. Bradshaw and C. Wheeler. J. Less-Common Metals 1, 94-105(1959) Apr.

A number of interesting results which have been obtained during studies of carbon and graphite are presented. A series of photomicrographs are shown in which deposits produced at different temperatures appear. Others show variation of density with deposition temperature. Results of x-ray examination are presented graphically. In addition, the results of high temperature deformation of carbon under three point loading are discussed. (J.R.D.)

15398

FURNACES FOR THE STUDY OF HIGH TEMPERATURE EQUILIBRIA. C. W. Haworth (Oxford Univ.). J. Less-Common Metals 1, 106-9(1959) Apr.

Laboratory furnaces for the heat treatment of metallurigical specimens at temperatures above 1200°C are described. Included are descriptions of conventional wound furnaces, induction heating, high current furnaces, and argon arc furnaces. (J.R.D.)

15399

METHODS FOR DETERMINING THE THERMODYNAMIC ACTIVITIES OF ALLOY CONSTITUENTS AT HIGH TEMPERATURES. P. Gross, D. L. Levi, and G. L. Wilson (Fulmer Research Inst., Stoke Poges, Bucks, Eng.). J. Less-Common Metals 1, 113-15(1959) Apr.

Methods of determining activities in alloys at high temperatures by measuring vapor pressures are described. The effusion method consists in measuring the molecular flow of a gas through an opening which must be wide and short in comparison with the mean free path. In the capillary vessel method, a heterogeneous equilibrium is established in which the substance of unknown activity participates and determines the pressure of one or more constituents of the gaseous phase. (J.R.D.)

15400

HIGH TEMPERATURE MECHANICAL WORKING OF ARC-CAST MOLYBDENUM. D. O. Pickman and E. W. Ward (Armament Research and Development Establishment, Fort Halstead, Kent, Eng.). J. Less-Common Metals 1, 116-24(1959) Apr.

Aspects of high temperature mechanical working of arc-cast Mo are discussed. Hot working is done at temperatures of 1750°C and above. Mo ingots have a large oriented grain structure, and the aim of hot working is to remove this structure as well as impurity concentrations existing at the large grain boundaries. Equipment for hot working is described including furnaces and handling tools. Methods of working are also described as well as resulting properties and the effects of the working atmosphere. (J.R.D.)

15401

TECHNIQUES FOR CREEP TESTING AT HIGH TEMPERATURES. D. J. Armstrong, D. Murray, and L. M. T. Hopkin (National Physical Lab., Teddington, Mddx., Eng.). J. Less-Common Metals 1, 125-31(1959) Apr.

High temperature experimental creep testing of cermets and refractory metals are discussed. A review of cermet testing techniques is given including equipment such as creep adapters, tools for high temperature creep testing, and furnaces. Ceramics testing equipment modification for use in testing refractory metals is also described. (J.R.D.)

15402

ATMOSPHERIC CONTAMINATION OF CHROMIUM AND ITS EFFECT ON MECHANICAL PROPERTIES. G. R. Wilms and T. W. Rea (Australian Defence Scientific Service, Melbourne). J. Less-Common Metals 1, 152-6 (1959) Apr.

Chromium heated in air at 950°C for 200 hours is contaminated to a considerable extent by nitrogen. This has a marked effect on the mechanical properties, especially the ductile → brittle transition temperature, the magnitude of the effect depending on the rate of cooling from 950°C. (auth)

15403

THE EQUILIBRIUM DIAGRAM OF THE SYSTEM BISMUTH—PALLADIUM. J. Brasier and W. Hume-Rothery (University Museum, Oxford). J. Less-Common Metals 1, 157-64(1959) Apr.

The equilibrium diagram of the system Bi—Pd was studied in the region 0 to 65 at. % Pd by thermal analysis and microscopical methods. The freezing point of Bi is depressed by the addition of Pd and sinks to a eutectic at 5.83 at. % Pd and 256°C. The liquidus then rises to 485.4°C, at which temperature the compound Bi_2Pd melts without change of composition. The compound BiPd gives rise to a pronounced maximum in the liquidus curve at 618°C, and there is a Pd rich eutectic at 577°C. At low temperatures the composition of the Bi_2Pd phase is about 34 at. % Pd. It undergoes a transformation at 380°C, in contrast to the earlier work of Zhuravlev and Zhdanov, according to whom the transformation took place at 200°C. There is a remarkable resemblance between the equilibrium diagrams of the systems Pd—Sb and Pd—Bi. Both give rise to compounds of the type PdX_2, the melting points of the Sb-compounds being systematically higher. (auth)

15404

TRANSFORMATION TEMPERATURES AND STRUCTURES IN URANIUM—FISSIUM ALLOYS. M. V. Nevitt and S. T. Zegler (Argonne National Lab., Lemont, Ill.). J. Nuclear Materials 1, 6-12(1959) Apr.

Solid state transformation temperatures and resulting structures are detailed for alloys of uranium with certain fission-product elements that might remain in a spent fuel from a fast reactor following pyrometallurgical refining. These elements, the aggregate of which is called "fissium" (Fs), are Zr, Nb, Mo, Tc, Ru, Rh, and Pd. The phase relations can be related to those in the dominant U—Mo—Ru ternary system. The uranium gamma phase is stabilized down to 552°C, while the beta phase is entirely suppressed at high fissium contents. Certain crystallographic data are given and the minor phases that occur in the alloys are identified. (auth)

15405

STUDY OF ALUMINUM—URANIUM ALLOYS—APPLICATION TO THE SOLID STATE TRANSFORMATION $UAl_3 \rightarrow UAl_4$. René Boucher (C[entre] d'É[tudes] N[ucleáires], Fontenay-aux-Roses, France). J. Nuclear Materials 1, 13-27(1959) Apr. (In French)

The coalescence of eutectic Al_4U + Al was studied microscopically. Two aluminum alloys 10.8 wt.% and 25.8 wt.% uranium were annealed at 600°C, 500°C, and 400°C for times from 30 minutes to 600 hours. During a treatment at 600°C for 10 hours the hardness decreases, the compound UAl_4 coalesces in nodules, and rolling the alloy is thus easier. Kinetics of the transformation $UAl_3 \rightarrow UAl_4$ in the solid state was studied micrographically. The phase UAl_3 is retained by oil-quenching from 750°C and the alloy is maintained at 600°C to obtain UAl_4. In an alloy of 40 wt.% U and 60 wt.% Al the time to achieve the transformation of UAl_3 in UAl_4 is short (1 hour at 600°C). In an alloy of 35 wt.% U, 64.9 wt.% Al and 0.1 wt.% Si the time of transformation is 100 hours. In an alloy of 35 wt.% U, 64.4 wt.% Al and 0.6 wt.% Si the phase UAl_3 is conserved even after 1000 hours at 600°C. Thus the addition of elements such as Si in relatively small proportions stabilizes UAl_3 not only at room temperature but also up to 600°C. Finally, the extent of the homogeneity domain of UAl_4 was investigated. This domain appears much narrower than generally supposed (64.2 wt.% to 66.3 wt.% U). (auth)

15406

SINTERING OF URANIUM OXIDES OF COMPOSITION UO_2 TO U_3O_8 IN VARIOUS ATMOSPHERES.
J. Williams, E. Barnes, R. Scott, and A. Hall (Atomic Energy Research Establishment, Harwell, Berks, Eng.). J. Nuclear Materials 1, 28-38(1959) Apr.

The behavior of uranium oxides of compositions in the range UO_2 to U_3O_8 on sintering in atmospheres of argon, nitrogen, carbon dioxide, vacuum, and hydrogen at various temperatures is described. Increase in surface area and departure from stoichiometric composition improve sintering performance. The beneficial effect of the additional oxygen is believed to be due chiefly to the increased high-temperature plasticity of the non-stoichiometric oxides. Additional effects may arise from the increase in surface area accompanying the phase change in oxides of oxygen/uranium ratio above ≈ 2.06, from the increased volatility of the non-stoichiometric oxide, and removal of adsorbed or absorbed hydrogen by the oxygen in excess of stoichiometry. The practical implications of the experimental results are discussed. (auth)

15407

THE PLASTIC DEFORMATION OF URANIUM OXIDES ABOVE 800°C. R. Scott, A. R. Hall, and J. Williams (Atomic Energy Research Establishment, Harwell, Berks, Eng.). J. Nuclear Materials 1, 39-48(1959) Apr.

Sintered uranium oxide of composition $UO_{2.06}$ or $UO_{2.16}$ and density exceeding 95% theoretical can be deformed plastically at about 800°C, but $UO_{2.00}$ becomes plastic only above ≈ 1600°C. The bend-creep characteristics of $UO_{(2+x)}$ are similar to those of metals inasmuch as they obey the expression $E = A \sinh(\sigma/\sigma_0) \exp(Q/RT)$ where E is the strain-rate, σ the stress and T the absolute temperature. A, σ_0, and Q are material constants. The activation energy of flow Q varies with the oxygen/uranium ratio, being about 65 kcal for $UO_{2.16}$, 72 kcal for $UO_{2.06}$ and ≥ 95 kcal for $UO_{2.00}$. This latter value for $UO_{2.00}$ is comparable with the activation energy of 95 to 120 kcal experimentally determined for the diffusion of uranium in $UO_{2.0}$. (auth)

15408

CORROSION TESTS BY HIGH TEMPERATURE WATER ON MONOCRYSTALS OF ALUMINUM OF 99.99% PURITY. INFLUENCE OF THE DEFORMATION AND RESTORATION AFTER COLD WORKING. P. LeLong and J. Hérenguel (Centre de Recherches d'Antony, [Paris]). J. Nuclear Materials 1, 58-72(1959) Apr. (In French)

Monocrystalline and polycrystalline specimens of high-purity aluminum (99.99%), prepared from wrought metal, were subjected to corrosion by water at temperatures above 100°C. By micrographic examination, the principal mechanisms of attack were identified and their kinetics studied. It is observed that: (1) a uniform film is first formed over the whole surface and, as previously shown, in the grain boundaries; (2) an irregular type of attack follows, accompanied by pitting; (3) the latter first outlines a network pattern (trace of the dendritic solidification texture) and appears in the grain boundaries, hence the influence of the impurity distribution is revealed even in this high-purity metal. The growth phenomenon previously observed with polycrystalline sheet specimens during corrosion also occurs with monocrystalline specimens. As in the case of the air-oxidation of zirconium, the metal creeps under the influence of the tension produced at the metal–oxide interface. Cold working tends to reduce the corrosion rate and attenuates or prevents a specimen growth; however, it does not appear to diminish the selective attack of the grain boundaries. Heat treatment of the cold-worked specimens at different temperatures produces a progressive change in corrosion behavior, but it is not until the first recrystallized grains appear that the corrosion behavior again approximates that of fully annealed metal. (auth)

15409

EFFECTS OF NEUTRON-INDUCED GAS FORMATION ON BERYLLIUM. C. E. Ells and E. C. W. Perryman (Atomic Energy of Canada, Ltd., Chalk River, Ont.). J. Nuclear Materials 1, 73-84(1959) Apr.

Specimens of beryllium which had received neutron irradiations up to an integrated fast flux of 10^{22} nvt were examined after annealing at various temperatures. For beryllium which had received the maximum irradiation, the annealing treatments have resulted in significant decreases in over-all density of the beryllium specimens, the density decrease being 0.8% and 20% after annealing individual specimens for one hour at 595°C and 995°C, respectively. The quantity of neutron-induced gases contained in the beryllium was shown to be approximately 23 cm^3 gas per cm^3 metal for the integrated fast flux of 10^{22} nvt. Analysis of the gas shows that it is mainly He^4. Metallographic evidence confirms that the density decreases are a direct result of void formation in the metal; it is concluded that the voids contain He^4 at pressures high enough to cause growth of the voids at the annealing temperatures. The detailed results of the constituent analysis of the neutron-induced gas confirm that the greater part of the gas arises from the (n, 2n) capture reaction on beryllium. (auth)

15410

ATOM MOVEMENTS AND DISLOCATION STRUCTURES FOR PLASTIC SLIP IN SINGLE CRYSTALS OF β-URANIUM. M. L. Kronberg (General Electric Research Lab., Schenectady, N. Y.). J. Nuclear Materials 1, 85-95(1959) Apr.

The crystallographic elements of slip in single crystals of β-uranium were interpreted in terms of formalized atom movements compatible with the structural characteristics of the crystal, and dislocation structures for accomplishing the movements were derived. A novel and critical part of the general problem lies in the fact that the unit cell of the simple tetragonal lattice contains the relatively large number of thirty atoms, which are arranged in a sufficiently complex manner to obscure any ready identification of a slip interface. The structure of the crystal is described in detail and the over-all structural requirements of any deformation model are deduced. It is then shown that the structure permits a flow process based on a double interface, i.e. the slipping portions of crystal are separated by a volume or zone of atoms which is needed to maintain structural continuity during the flow process. The width of the zone corresponds to a single lattice spacing normal to the observed slip plane of the lattice. The body of the paper is concerned with the development and description of the associated process of plastic flow. (auth)

15411

THE EFFECTS OF HEATING NEUTRON IRRADIATED BERYLLIUM. J. B. Rich, G. B. Redding, and R. S. Barnes (Atomic Energy Research Establishment, Harwell, Berks, Eng.). J. Nuclear Materials 1, 96-105 (1959) Apr.

Small pieces of a beryllium shim rod from the Materials Testing Reactor were heated, and changes in microstructure, volume, and mechanical properties observed. The beryllium which was estimated to have received a dose of about 7.6×10^{21} fast neutrons/cm^2 contained about 10 cm^3 at N.T.P. of helium per cm^3 and this precipitated as fine gas bubbles during heating for an hour at temperatures above 600°C. These bubbles grew, particularly at the grain boundaries, during further heating, until at 1100°C they were about 10^{-3} cm diameter. The precipitation and growth of the bubbles produced an increase in the volume of the samples, commencing at about 600°C and eventually reaching 30% at 1000°C. The irradiated beryllium is very brittle, even above room temperature, and this may be aggravated by the large gas bubbles lying on the grain boundaries. The observations are discussed in relation to those already reported for beryllium containing large local concentrations of helium injected with a cyclotron. (auth)

15412

PRECIPITATION OF HELIUM IN BERYLLIA IRRADIATED BY NEUTRONS. H. Frisby, A. Bisson, and R. Caillat (Service de Chimie des Solides, Saclay, France). J. Nuclear Materials 1, 106-8(1959) Apr. (In French)

Electron microscopic examinations were made of irradiated and non-irradiated BeO samples before and after thermal treatment. In the non-irradiated samples the average dimension of the crystals is 10 to 20 microns, and the majority of the facets are hidden with stria. After thermal treatment the beryllium oxide presents no bubbles. In the irradiated beryllia, the crystals have the same dimensions but smooth facets are more numerous. Thermal treatment for 24 hr at 800°C causes no visible change. After a second thermal treatment at 1000°C the samples have two kinds of bubbles, closely packed bubbles with a diameter of several hundred angstroms and some bubbles five to ten times larger with a polyhedral form. A third annealing at 1200°C results in elongated bubbles of several microns on the smooth facets which delineate the crystal. An annealing at 1500°C accentuates the collection of the bubbles into polyhedral cavities of the order of several tens of microns. The results show that the neutron-induced gas precipitates in the mass of the sample and then the bubbles migrate toward the surface of the grain boundaries. (J.S.R.)

15413

EFFECTS OF O:U RATIO ON THE IRRADIATION BEHAVIOUR OF URANIUM OXIDE. A. S. Bain and J. A. L. Robertson (Atomic Energy of Canada, Ltd., Chalk River, Ont.). J. Nuclear Materials 1, 109-10 (1959) Apr.

The effect of the O:U ratio on the irradiation behavior of uranium oxide was investigated. Uranium dioxide powder was cold compacted and then sintered in steam for four hours at 1325°C. The stoichiometric oxide was obtained by holding the oxide in hydrogen for an additional hour at the same temperature. All pellets were finished to the same diameter and inserted in identical sheaths of Zircaloy-2. The specimens were irradiated in a pressurized water-cooled loop in such a manner that a stoichiometric specimen was adjacent to a non-stoichiometric one on each side of the neutron flux maximum. In the non-stoichiometric samples with a O:U ratio of 2.15, a zone of grain growth 0.24 in. in diameter was observed. Only the normal cracking was found in the stoichiometric specimens. (J.S.R.)

15414

A COMPARISON OF ARGON AND HELIUM WELDING SHIELDS. J. Barker. Nuclear Power 4, No. 38, 119-20 (1959) June.

Two pieces of Zircaloy-2 were welded, one in Ar the other in He, at 100, 200, 300, 400, and 500 amps. Arc lengths and other conditions were the same. The welds were compared as to width and depth of puddle. The depth curves are almost parallel up to 400 amp (He curve showing greater penetration) where the He curve begins to show more penetration. The Ar width curve shows an increase up to 300 amp then becomes almost vertical at 400 amp and then the width decreases between 400 and 500 amps. The He width curve shows an almost straight-line increase to 400 amp becoming almost vertical thereafter. Grain sizes of He welds are larger for a given amperage but about equal for a given penetration. (T.R.H.)

15415

THE DEFORMATION OF LITHIUM, SODIUM AND POTASSIUM AT LOW TEMPERATURES: TENSILE AND RESISTIVITY EXPERIMENTS. D. Hull (Atomic Energy Research Establishment, Harwell, Berks, Eng.) and H. M. Rosenberg (Clarendon Lab., Oxford). Phil. Mag. (8) 4, 303-15(1959) Mar.

Stress-strain tests were made on Li, Na, and K at temperatures between 293 and 4.2°K. At higher temperatures the behavior of all three metals is very similar. They are soft and after the yield point very little hardening is observed. At low temperatures Li and Na transform to f.c.c. and h.c.p. structures, respectively, on deformation, the character of their stress-strain curves changes accordingly, and they harden continuously throughout the test. At 20 and 4.2°K Li deforms with many regions of discontinuous slip and at 4.2°K it fractures in a brittle fashion. While K remains b.c.c. down to 4.2°K it also exhibits an unusual type of hardening at 20 and 4.2°K which is very temperature dependent. The change in the electrical resistivity during low temperature deformation was also measured. There was no detectable change when K was deformed at 4.2°K. This offers further evidence that a large proportion of the resistivity change which is observed when metals are deformed is due to stacking faults. Both Li and Na give considerable resistivity changes when they are deformed at 4.2°K and much of this change is ascribed to the scattering of electrons at the faulted regions within the transformed phases. (auth)

15416

THE DESIGN OF ELECTROMAGNETIC PUMPS FOR LIQUID METALS. D. A. Watt (Atomic Energy Research Establishment, Harwell, Berks, Eng.). Proc. Inst. Elec. Engrs. (London) Pt. A 106, 94-103(1959) Apr.

The practical design of electromagnetic pumps is discussed with particular reference to construction of the duct/electrode element. Common features of electrical design are explained in terms of a simple theory of tube efficiency. The scope of d-c pumps in meeting different duties and practical conditions is indicated. Some results of an experimental investigation of d-c pump performance in a 4 in.-diameter pipe loop are given. The significance of end current loss is indicated, and also the equivalent reduction effected by the presence of a graded fringing field in the end regions. A technique of electrode "wetting" suitable for mercury and stainless steel is described, together with gas entrainment experiments. A homopolar generator with mercury collector rings is described. This type of machine would provide an efficient source of current for the d-c pump. The newer types of rectifier are briefly compared with the generator for this application. Reference is made to polyphase travelling-field pumps, and their appropriate application is discussed. Simple theory of design is given, with relationships for optimum design at standard supply frequency. Other possible designs of large electromagnetic pump are briefly examined and compared with the basic forms of conduction and induction pump. The various classes of pump suitable for laboratory use are mentioned and general principles of selection are offered. (auth)

15417

INTERDIFFUSION OF URANIUM AND NICKEL. Steinar Aas (Institutt for Atomenergi, Lillestrom, Norway) and Alfred F. Steinegger (Reactor, Ltd., Wuerenlingen, Switzerland). Tidsskr. Kjemi Bergvesen Met. 10, 171-5(1957).

The rate of growth of the total layer of intermetallic compounds has been determined as function of time and temperature from 300 to 600°C. It was found that the penetration of nickel into uranium is about four times faster than that of uranium in nickel at 500 and 600°C. The activation energy was determined to be a = 17.1 kcal for the temperature range 400 to 600°C. Six different intermetallic phases could be distinguished under the microscope. U_6 Ni, U_7 Ni_9 and U_5 Ni_7 were identified by etching techniques, the remaining ones were identified according to their relative position. (auth)

15418

BRAZE BONDING STAINLESS-STEEL FUEL ELEMENTS FOR NUCLEAR REACTORS. P. P. King and R. K. McGeary (Westinghouse Electric Corp., Pittsburgh). Welding J. (N. Y.) 38, 241s-6s(1959) June.

A technique was developed that utilizes electroless plating of parts with nickel which contains phosphorus. The plating serves as the brazing alloy at 1850-1900°F in a dry-hydrogen atmosphere. Success of the technique depends upon contact of the parts so that phosphorus depletion of the film of braze alloy by diffusion of the phosphorus into the steel is readily attained, thus producing a ductile single-phase bond alloy. Under controlled conditions of joint preparation, erosion of the base metal by the brazing alloy was negligible during brazing cycles of up to 8 hr at 1875°F. Optimum bundle assemblies were produced by brazing for one hour at 1850-1875°F although longer brazing times produced stronger bundle assemblies because of growth of the braze-bonded region. Parts fit-up was found to be the most critical factor in influencing joint strength and ductility of large multi-tube subassemblies. Brazing-fixture design was critical in controlling subassembly fit-up, lateral dimensions and longitudinal straightness. Fuel-element subassemblies up to 95 in. long and 2.743 in. square were brazed with lateral dimensions within ±0.015 in. of design and longitudinal bowing of less than 0.060 in. Braze-bonding methods using a paste application of Ni-P, Ni-Cr-P, Ni-Si, Ni-Si-P, Ni-Cr-Si, or Ni-Fe-Si-Mo-P were found to give less satisfactory results. The corrosion resistance of these alloys was investigated and only the Ni-Si and Ni-Si-P alloys were unacceptable for high-temperature water service. (auth)

15419

SOLDER BONDING ALUMINUM TO URANIUM. H. W. Mishler and D. C. Martin (Battelle Memorial Inst., Columbus, Ohio); J. T. Niemann (North American Aviation, Columbus, Ohio); and R. P. Sopher (Electric Boat Div., General Dynamics Corp., Groton, Conn.). Welding J. (N. Y.) 38, 268s-72s(1959) June.

A study was undertaken to determine if flat-plate fuel elements could be produced by solder bonding aluminum sheets to a uranium core. It was necessary to plate the uranium with chromium, iron, or nickel, which served as a diffusion barrier. The solders used were lead, tin, zinc, and their alloys. No provision was made for removing surface oxides on the base metals. Therefore, it was necessary to plate the aluminum and the uranium diffusion barrier. The best bonds were produced with aluminum plated with 0.5 mil of copper and nickel-plated uranium given a copper flash. Corrosion tests on bonded samples showed zinc was the most corrosion-resistant solder tested. Successive samples made with like solders sometimes varied in joint quality. A greater variation would probably exist in larger samples made under mass-production conditions. (auth)

15420

PREPARATION AND PROPERTIES OF SINTERABLE NICKEL ALUMINIDE. Erich Fitzer and Peter Gerasimoff (Siemens-Planiawerke AG, Vienna and Technischen Hochschule, Vienna). Z. Metallk. 50, 187-96(1959) Apr. (In German)

A method is described by which a sinterable nickel aluminide powder can be obtained from a reaction in mercury. Highest resistance to scaling is obtained in sinter alloys with 80 to 84% Ni. An oxidizing heat treatment increases the strength of the alloys. At 500°C maximum tensile strength of 80 kg/mm^2 is reached. The alloys and their processing are described in detail. (auth)

15421

PHASE STRUCTURE OF THE NICKEL-COPPER-GERMANIUM SYSTEM. Walter Burkhardt and Konrad Schubert (Max-Planck-Institut für Metallforschung, Stuttgart). Z. Metallk. 50, 196-8(1959) Apr. (In German)

An isothermal reaction at 500°C in the nickel-copper-germanium system has been investigated by x rays and metallographic methods. $Ni_3Cu_2Ge_2$ has hexagonal structure, $Ni_{15}Cu_{65}Ge_{20}$ is of the A13-type, and $Ni_{15}Cu_{58}Ge_{22}$ phases similar to γ brass are formed. (auth)

15422

TERNARY CARBIDES OF THE T METALS NICKEL, COBALT, IRON, AND MANGANESE WITH GERMANIUM AND INDIUM. Leo J. Hütter and Hans H. Stadelmaier

(North Carolina State Coll., Raleigh). Z. Metallk. 50, 199-203(1959) Apr. (In German)

In the ternary systems Co–Ge–C, Fe–Ge–C, Mn–Ge–C, Ni–In–C, Co–In–C, Fe–In–C double carbides were found that correspond to the formula T_3BC_x, where T is the transition metal. Together with the known carbide Mn_3InC these compounds belong to a separate group of carbides which have in common an ordered face-centered cubic structure. The electronic nature of these compounds is discussed. (auth)

15423

INVESTIGATIONS ON THE PLASTICITY OF SINGLE CRYSTALS OF NICKEL–COBALT ALLOYS. Joachim Meissner (Max-Planck-Institut für Metallforschung, Stuttgart). Z. Metallk. 50, 207-17(1959) Apr. (In German)

Single crystals of nickel and nickel–cobalt alloys with cobalt contents up to 40% were deformed at room temperature and at 90°K. The shear stress-shear strain curves show the three stages that are characteristic for face centered cubic metals. The dependence of the work-hardening parameters on concentration is due only to the variation of the stacking-fault energy which decreases with increasing cobalt content. The critical shear stress, the extent of the easy glide stage, and the stress at the beginning of the third stage increase with decreasing temperature and increasing cobalt content, whereas the slope of the work-hardening curve in the second stage of linear hardening is independent of temperature and concentration. This is to be expected from extrapolating the tensile properties of pure metals to materials of low stacking-fault energies. (auth)

15424

SIGNIFICANCE OF THE Z STATE. Horst-Guido Müller and Peter Muth. Z. Metallk. 50, 217-24(1959) Apr. (In German)

The kinetics of "K-Zustand" formation and destruction in nickel–chromium and nickel–chromium–iron alloys are investigated by measurements of resistivity, thermoelectric power, and Hall constant. The results may be understood from a shift of the Fermi level to lower energies as the "K-Zustand" forms. A transition of 4s electrons to 3d states is indicated. (auth)

15425

VAPOR-PRESSURE MEASUREMENTS ON LIQUID ZINC–TIN AND MAGNESIUM–LEAD ALLOYS. Erich Scheil and Friedrich Wolf (Max-Planck-Institut für Metallforschung, Stuttgart). Z. Metallk. 50, 229-33 (1959) Apr. (In German)

Vapor pressure of zinc over zinc–tin alloys and vapor pressure of magnesium over magnesium–lead alloys have been measured. The activity of zinc gives a tendency of decomposition, the activity of magnesium a tendency of formation compounds. The maximum value of the heat of mixing in the zinc–tin system apparently decreases with increasing temperature. (auth)

15426

THE CHEMICAL BEHAVIOR OF ZIRCONIUM. Warren B. Blumenthal. Princeton, N. J., D. Van Nostrand Company, Inc., 1958. 404p.

A book containing a broad and detailed survey of the chemistry of zirconium is presented. Included are the history of zirconium, interstitial solutions and intermetallic compounds, properties of the halogenides, oxides and zirconates, zircon and the complex silicates, sulfatozirconic acids, sulfates, and sulfonates, compounds of inorganic acids, carboxylates and other organic compounds of zirconium. (J.E.D.)

15427

IMPROVEMENTS IN OR RELATING TO ALLOYS OF URANIUM. David Cecil Charles Minty and Peter Charles Leslie Pfeil (to United Kingdom Atomic Energy Authority). British Patent 813,271. May 13, 1959.

Uranium–thorium alloys containing 0.1 to 5.0% Th are described. The Th gives improved creep resistance. If U produced by Mg reduction of UF_4 is used, the large grain size plus β-quenching at 725°C give a further improvement. (T.R.H.)

15428

IMPROVEMENTS IN OR RELATING TO SHIELDING DEVICES FOR MACHINING TOXIC AND EXPENSIVE MATERIALS AND THOSE HAVING A CRITICAL MASS. Ronald Tunstall Ackroyd and Dennis Kenyon (to United Kingdom Atomic Energy Authority). British Patent 813,928. May 27, 1959.

A device which permits machining of toxic, expensive, or fissionable materials safely and without loss is described. It consists of a tube which encloses the piece to be machined and is equipped with rubber sleeves to seal to the tailstock of the lathe. An opening with a flapseal is provided for inserting tools; other openings are provided for inert gas sweeping or cutting oil application. (T.R.H.)

15429

CANNED SLUG. M. Burton (to U. S. Atomic Energy Commission). U. S. Patent 2,873,853. Feb. 17, 1959.

Fuel elements of the type comprised of a core of fissionable material enclosed in a jacket of non-fissionable, corrosion resistant material are presented. In this invention the fissionable core is shorter than the jacket member, to provide a void chamber in one end of the assembled element. The fissionable material is separated from the chamber by an inwardly extending portion of the jacket member containing a gas permeable wafer centrally disposed therein. The outer end of the chamber is closed by the end of the jacket which has a rupture disk centrally disposed therein. Gases formed by the irradiation of the fissionable material pass through the porous wafer into the chamber thereby causing a gradual increase in the pressure in the chamber. The rupture disk is designed to fail at a lower pressure than that which would rupture the jacket. Upon rupture of the disk, the gases in the chamber escape into the coolant channel and coolant enters the chamber but is prevented from coming into contact with the fissionable material by the action of the gases under pressure passing outwardly through the wafer. The ruptured fuel element may be readily detected by monitoring the reactor coolant system.

15430

METHOD AND APPARATUS FOR FABRICATING TUBULAR UNITS. G. W. Haldeman (to U. S. Atomic Energy Commission). U. S. Patent 2,874,459. Feb. 24, 1959.

A method and apparatus are described for fabricating tubular assemblies such as clad fuel elements for nuclear reactors. According to this method, a plurality of relatively short cylindrical slug-shaped members are inserted in an outer protective tubular jacket, and the assembly is passed through a reducing die to draw the outer tubular member into tight contact with the slug members, the slugs being automatically spaced with respect to each other and helium being inserted during the drawing operation to fill the spaces. The apparatus includes a pusher rod which functions to space the slug-elements equidistantly by pushing on them in the direction of drawing but traveling at a slower rate than that of the tubular member.

15431

METHOD OF MAKING ALLOYS OF BERYLLIUM WITH PLUTONIUM AND THE LIKE. O. J. C. Runnals (to U. S. Atomic Energy Commission). U. S. Patent 2,875,041. Feb. 24, 1959.

The production of alloys of beryllium with one or more of the metals uranium, plutonium, actinium, americium, curium, thorium, and cerium are described. A halide salt of the metal to be alloyed with the beryllium is heated at 1300°C in the presence of beryllium to reduce the halide to metal and cause the latter to alloy directly with the beryllium. Although the heavy metal halides are more stable, thermodynamically, than the beryllium halides, the reducing reaction proceeds to completion if the beryllium halide product is continuously removed by vacuum distillation.

15432

METHOD AND APPARATUS FOR MAKING URANIUM-HYDRIDE COMPACTS. W. Wellborn and John R. Armstrong (to U. S. Atomic Energy Commission). U. S. Patent 2,877,088. Mar. 10, 1959.

A method and apparatus are presented for making compacts of pyrophoric hydrides in a continuous operation out of contact with air. It is particularly useful for the preparation of a canned compact of uranium hydride possessing high density and purity. The metallic uranium is enclosed in a container, positioned in a die body arranged to be heated. The container is evacuated and then hydrogen in sufficient amount to convert the uranium to the hydride is admitted and the container sealed. Heat is applied to bring about the formation of the hydride, following which compression is used to form the compact sealed in a container ready for use.

15433

METHOD OF HOT ROLLING URANIUM METAL. Albert R. Kaufmann (to U. S. Atomic Energy Commission). U. S. Patent 2,877,149. Mar. 10, 1959.

A method is given for quickly and efficiently hot rolling uranium metal in the upper part of the alpha phase temperature region to obtain sound bars and sheets possessing a good surface finish. The uranium metal billet is heated to a temperature in the range of 1000°F to 1220°F by immersion in a molten lead bath. The heated billet is then passed through the rolls. The temperature is restored to the desired range between successive passes through the rolls, and the rolls are turned down approximately 0.050 inch between successive passes.

15434

PROCESS OF COATING WITH NICKEL BY THE DECOMPOSITION OF NICKEL CARBONYL. T. B. Hoover (to U. S. Atomic Energy Commission). U. S. Patent 2,881,094. Apr. 7, 1959.

An improved process is presented for the deposition of nickel coatings by the thermal decomposition of nickel carbonyl vapor. The improvement consists in incorporating a small amount of hydrogen sulfide gas in the nickel carbonyl plating gas. It is postulated that the hydrogen sulfide functions as a catalyst.

PARTICLE ACCELERATORS AND HIGH-VOLTAGE MACHINES

Refer also to abstract 15474.

15435 AFCRC-TN-58-242

Harvard Univ., Cambridge. Harvard Coll. Observatory. CALCULATIONS ON THE AVERAGE POWER SPECTRUM OF THE CAMBRIDGE ELECTRON ACCELERATOR. "CHOPPER" TRANSMISSION STUDIES. Scientific Report No. 3. D. H. Tomboulian and D. E. Bedo. Jan. 15, 1958. 13p. Contract AF19(122)-482. (AD-152477).

The investigation presented is concerned with the problem of discriminating against the high frequency content of the synchrotron radiation when it is desired to utilize the continuum for experiments in the far ultraviolet region. In order to modify the incident spectrum, so that the intensities in the short wavelength portion of the 6-Bev distribution are made sufficiently weak, the introduction of a "chopper" or rotating sector disk into the path of the radiation is proposed. (auth)

15436 MURA-454

Midwestern Universities Research Assn., Madison, Wis. A SUMMARY OF THE LINEAR ORBIT PROPERTIES OF AN ACCELERATOR HAVING A GENERAL MAGNETIC FIELD. George Parzen. Apr. 21, 1959. 8p. Contract AT(11-1) 384. $0.50(OTS.

Results for the linear orbit properties of an accelerator with a general magnetic field are listed. The results in a previous report, MURA-397, were extended in the report, MURA-451, so that they now hold for machines with small N, and for tunes ν_r or ν_z which are close to $\frac{1}{2}$ N. Derivations and somewhat more general results are given in the above mentioned reports. (W.D.M.)

15437 UCRL-8616

California. Univ., Berkeley. Lawrence Radiation Lab.

POWER-SUPPLY SYSTEM FOR THE BEVATRON AUXILIARY MAGNETS. C. A. Harris. May 1959. 24p. Contract W-7405-eng-48. $0.75(OTS).

Some of the basic considerations in the design of the protective interlocking of the d-c power system for auxiliary magnets used at the Bevatron are described. The required current-regulation tolerances are given along with a discussion of the various problems associated with certain special applications of the magnets. (auth)

15438 AEC-tr-3708

SPACE CHARGE THEORY IN A BETATRON. (Theorie de la Charge d'espace Dans le Betatron.) P. Gratreau and Ch. Maisonnier. Translated for Oak Ridge National Lab. from CEA report, CEN-S-PA-7738. 27p. (Includes original, 13p.). $4.80(ph), $2.70(mf) JCL.

A theoretical study is presented which takes into account the influence of the space charge on the betatron beam intensity. The equilibrium of a toric dense beam of particles of high energy is considered. Equations are derived and practical consequences are discussed. (W.D.M.)

15439

PARTICLE ACCELERATORS. [Louis] Leprince-Ringuet. p.19-27 of "Journées d'Information sur l'Énergie Nucléaire, 14-15-16 Janvier 1957."

Documents, Suppl. to No. 114. France, Commissariat General á la Productivité. 1957. 203p. (In French)

A brief survey is made of the history of the development of particle accelerators. The low-energy accelerators of the Van de Graaff type are described, and then the high energy accelerators are discussed. The linear accelerators are only briefly considered, but the cyclotron, the synchrocyclotron, the betatron, and the synchrotron are discussed in more detail. (J.S.R.)

15440

A BIAS FUNCTION GENERATOR FOR THE ZERO GRADIENT SYNCHROTRON. L. K. Wadhwa (Argonne National Lab., Lemont, Ill.). IRE Trans. Nuclear Sci. NS-6, 2-11(1959) Mar.

An analog function generator producing a biasing current for the permeability-tuned master oscillator of the zero gradient synchrotron is described. It produces the bias function with a precision of ± 0.02 per cent and is capable of delivering about 3 amperes of current into a predominantly resistive load of a quarter of an ohm. The input information to the function generator is obtained from proton accelerator parameters such as the magnetic guide field B_g and $\dot{B}_g$ and the guide magnet current I_g and $\dot{I}_g$. The total bias function is obtained as a result of adding outputs from the 1) B_g read-out, 2) hump generator, and 3) biased diode network. A specially developed electronic system and an analog-to-digital converter have been employed to make static and dynamic measurements with a view to determining the precision of the function generator. (auth)

15441

APPLICATIONS OF QUADRATIC NON-LINEARITY IN STRONG FOCUSING ACCELERATOR. Yu. F. Orlov (Inst. of Physics, Academy of Sciences, Armenian S.S.R.). Pribory i Tekh. Ekspt. No. 2, 8-11(1959) Mar.-Apr. (In Russian)

Quadratic non-linearity can be used for reducing betatron pulse frequencies. The effect can be conveniently used for eliminating dangerous synchrobetatron resonance which appears with high frequency multiplicity. (tr-auth)

15442

MEASUREMENTS OF PARTICLE ORBIT DISTRIBUTION BY AMPLITUDES OF RADIAL-PHASE OSCILLATIONS. K. A. Belovintsev and B. N. Yablokov (Inst. of Physics, Academy of Sciences U.S.S.R.). Pribory i Tekh. Ekspt. No. 2, 12-15(1959) Mar.-Apr. (In Russian)

A method is suggested for measuring the accelerated particle distributions by radial-phase oscillation amplitudes. Experimental distribution measurements, and the derived half-width dependence of the accelerated cluster on energy and switching time is in a good agreement with theoretical data. (tr-auth)

15443

APPARATUS FOR MEASURING INTENSITY DISTRIBUTION IN THE EXPANDED PULSE OF SYNCHROTRON GAMMA RADIATION. K. A. Belovintsev, O. A. Karpukhin, A. V. Kutsenko, A. A. Shapkin, and B. N. Yablokov (Inst. of Physics, Academy of Sciences, U.S.S.R.). Pribory i Tekh. Ekspt. No. 2, 15-18(1959) Mar.-Apr. (In Russian)

Descriptions are given of a device used with the 280-Mev synchrotron (at the Inst. of Physics, Academy of Sciences, U.S.S.R.) for measuring the distribution of intensities in the extended γ pulse. The device is based on the principle of a single channel intermittent analyzer. The automatic measurements are conducted by an automatic telephone to a distant recorder. (tr-auth)

15444

LINEAR ACCELERATOR. Gene R. Marner and Ralph L. McCreary (to Collins Radio Co.). British Patent 813,953. May 27, 1959.

A linear accelerator is described. The output of one electron gun or source, in the form of a cup-shaped cathode-grid resonating cavity, is fed at low voltage into the outer edge of a larger cylindrical resonant cavity. Another source at the center of the larger cavity is phased to emit electrons at peak positive voltage in the large cavity. Thus, a highly-accelerated beam of electrons is provided at the higher-potential center of the larger cavity. (T.R.H.)

15445

MASS SEPARATORS. F. Oppenheimer and J. W. Bell (to U. S. Atomic Energy Commission). U. S. Patent 2,874,295. Feb. 17, 1959.

An improvement in the mounting arrangement for the ion source within the vacuum tank of a calutron is presented. The entire source is supported by the vacuum envelope through the medium of a bracket secured to a removable face plate. The bracket forms a supporting platform that is generally transverse to the magnetic field. The ion generator is mounted on a pedestal-type insulator supported on the bracket, and the hot leads are brought into the vacuum envelope through a tubular elbow connected to the vacuum envelope, having the axis of its outer opening aligned with the magnetic field at which point a bushing-type insulator is employed. With this arrangement the ion source is maintained at a positive potential with respect to the vacuum tank and the problem of electron bombardment of the insulator is considerably reduced.

15446

CALUTRON ION SOURCE. W. M. Brobeck (to U. S. Atomic Energy Commission). U. S. Patent 2,875,339. Feb. 24, 1959.

An ion source is described wherein a portion of the filament serving as a cathode for the arc is protected from the effects of non-ionized particles escaping from the ionizing mechanism. In the described ion source, the source block has a gas chamber and a gas passage extending from said gas chamber to two adjacent faces of the source block. A plate overlies the passage and abuts one of the aforementioned block faces, while extending beyond the other face. In addition, the plate is apertured in line with the block passage. The filament overlies the aperture to effectively shield the portion of the filament not directly aligned with the passage where the arc is produced.

15447

HAND TRUCK FOR HANDLING EQUIPMENT. D. W. King (to U. S. Atomic Energy Commission). U. S. Patent 2,874,860. Feb. 24, 1959.

A truck is described for the handling of large and relatively heavy pieces of equipment and particularly for the handling of ion source units for use in calutrons. The truck includes a chassis and a frame pivoted to the chassis so as to be operable to swing in the manner of a boom. The frame has spaced members so arranged that the device to be handled can be suspended between or passed between these spaced members and also rotated with respect to the frame when the device is secured to the spaced members.

15448

CALUTRON ION SOURCE. E. J. Lofgren (to U. S. Atomic Energy Commission). U. S. Patent 2,874,296. Feb. 17, 1959.

An improvement is described in ion source mechanisms whereby the source structure is better adapted to withstand the ravages of heat, erosion, and deterioration concomitant with operation of an ion source of the calutron type. A pair of molybdenum plates define the exit opening of the arc chamber and are in thermal contact with the walls of the chamber. These plates are maintained at a reduced temperature by a pair of copper blocks in thermal conducting contact therewith to form subsequent diverging margins for the exit opening.

15449

HIGH ENERGY PARTICLE ACCELERATOR. E. D. Courant, M. S. Livingston, and H. S. Snyder (to U. S. Atomic Energy Commission). U. S. Patent 2,882,396. Apr. 14, 1959.

An improved apparatus is presented for focusing charged particles in an accelerator. In essence, the invention includes means for establishing a magnetic field in discrete sectors along the path of moving charged particles, the magnetic field varying in each sector in accordance with the relation. $B = B_0 [1 - n (r-r_0)/r_0]$, where B_0 is the value of the magnetic field at the equilibrium orbit of radius r_0 of the path of the particles, B equals the magnetic field at the radius r of the chamber and n equals the magnetic field gradient index, the polarity of n being abruptly reversed a plurality of times as the particles travel along their arcuate path. With this arrangement, the particles are alternately converged towards the axis of their equilibrium orbit and diverged therefrom in successive sectors with a resultant focusing effect.

15450

ION SOURCE UNIT FOR CALUTRON. D. H. Sloan, H. P. Yockey, and F. H. Schmidt (to U. S. Atomic Energy Commission). U. S. Patent 2,882,406. Apr. 14, 1959.

An improvement in the mounting arrangement for an ion source within the vacuum tank of a calutron device is reported. The cathode and arc block of the source are independently supported from a stem passing through the tank wall. The arc block may be pivoted and moved longitudinally with respect to the stem to thereby align the arc chamber in the block with the cathode and magnetic field in the tank. With this arrangement the elements of the ion source are capable of precise adjustment with respect to one another, promoting increased source efficiency.

15451

CALUTRON. E. O. Lawrence and W. M. Brobeck (to U. S. Atomic Energy Commission). U. S. Patent 2,882,407. Apr. 14, 1959.

An ion source is described for a calutron especially designed to improve the uniformity of charge vapor flow when the vapor encounters the arc. The inventive feature of the source consists of a specific source block construction wherein heater means prevents condensation from taking place within the block, and a separate vapor generator is supported on the wall of the block by a hollow thimble. The thimble communicates with a bore cavity in the block and the vapor flows therethrough into the cavity and uniformly out a slot along the length of the cavity where the arc discharge is located.

15452

ION SOURCE FOR A CALUTRON. E. J. Lofgren (to U. S. Atomic Energy Commission). U. S. Patent 2,882,408. Apr. 14, 1959.

This patent relates to calutron devices and deals particularly with the mechanism used to produce the beam of ions wherein a charge material which is a vapor at room temperature is used. A charge container located outside the tank is connected through several conduits to various points along the arc chamber of the ion source. In addition, the rate of flow of the vapor to the arc chamber is controlled by a throttle valve in each conduit. By this arrangement the arc can be regulated accurately and without appreciable time lag, inasmuch as the rate of vapor flow is immediately responsive to the manipulation of the throttle valves.

15453

DUAL HEATED ION SOURCE STRUCTURE HAVING ARC SHIFTING MEANS. E. O. Lawrence (to U. S. Atomic Energy Commission). U. S. Patent 2,882,409. Apr. 14, 1959.

An ion source is presented for calutrons, particularly an electrode arrangement for the ion generator of a calutron ion source. The ion source arc chamber is heated and an exit opening with thermally conductive plates defines the margins of the opening. These plates are electrically insulated from the body of the ion source and are connected to a suitable source of voltage to serve as electrodes for shaping the ion beam egressing from the arc chamber.

15454

ION SOURCE. W. M. Brobeck (to U. S. Atomic Energy Commission). U. S. Patent 2,882,410. Apr. 14, 1959.

This patent deals with calutrons and more particularly to an arrangement therein whereby charged bottles in a calutron source unit may be replaced without admitting atmospheric air to the calutron vacuum chamber. As described, an ion unit is disposed within a vacuum tank and has a reservoir open toward a wall of the tank. A spike projects from the source into the reservoir. When a charge bottle is placed in the reservoir, the spike breaks a frangible seal on the bottle. After the contents of the bottle are expended the bottle may be withdrawn and replaced with another charge bottle by a vacuum lock arrangement in conjunction with an arm for manipulating the bottle.

15455

ION PRODUCING MECHANISM. F. F. Oppenheimer (to U. S. Atomic Energy Commission). U. S. Patent 2,882,411. Apr. 14, 1959.

This patent pertains to calutrons and more particularly to means for introducing gas at selected points in the arc chamber of a calutron source to remedy unsteadiness in the arc. The disclosed ion source has a baffle at the gas entrance in the arc chamber for directing part of the gas flow toward the anode end of the chamber. The resulting arc is much steadier, resulting in an ion beam of increased current.

PHYSICS AND MATHEMATICS

General

15456 AD-205351

Stanford Research Inst., Menlo Park, Calif.

OBTAINING A SYSTEM OF DOSIMETRY. Progress Report No. 8 [for] November 28, 1957—January 27, 1958. S. I. Taimuty. 13p. Project No. 7-84-01-002. Contract DA-19-129-QM-766.

Progress is reported in the evaluation of integrating dosimetry systems. The results indicate that two dosimetry systems, ceric sulfate and glass, were the best available for use with cobalt-60 gamma radiation in the dosage range of interest for food sterilization. Additional data were obtained on the response and fading of silver-activated phosphate glass dosimeters. Two models of an electron beam secondary emission current monitor were tested. The response of the devices was found to be linear and independent of electron beam energy in the range 10 to 30 Mev. Saturation was found to be possible at chamber voltages less than 100 volts for instantaneous current densities as high as 150 ma/cm^2. These characteristics indicate that the device provides a straightforward method of monitoring the current in high-energy electron beams. (C.H.)

15457 AD-209516

Stanford Research Inst., Menlo Park, Calif.

OBTAINING A SYSTEM OF DOSIMETRY. Progress Report No. 11 for May 28 to July 27, 1958. S. I. Taimuty. 9p. Project No. 7-84-01-002. Contract DA-19-129-QM-766.

Radiation dosimetry systems were developed for use during the radiosterilization of foods to effect their preservation. Data are presented on the development of ceric sulfate and cobalt glass dosimetry systems for use with a cobalt-60 gamma source. Results are included from preliminary tests on the feasibility of using the measurement of electron range in aluminum as a continuous beam energy monitor. Results of experiments at 1 and 24 Mev indicate that the method is sufficiently promising to warrant further study. (C.H.)

15458 AD-212975

Office of the [Assistant] Secretary of Defense (Research and Engineering), Washington, D. C.

SHOCK, VIBRATION AND ASSOCIATED ENVIRONMENTS. PART II. Bulletin No. 27. The 27th Symposium on Shock, Virbration, and Associated Environments, held at the U. S. Army Air Defense Center, Fort Bliss, El Paso, Texas, on February 25-27, 1959. June 1959. 237p.

A compilation of papers appearing as Part II of the 27th Symposium on Shock, Vibration, and Associated Environments is presented. Subjects such as re-entry simulation, design philosophy and environmental test, complex wave vibration testing, and high intensity acoustic noise testing are discussed. (J.R.D.)

15459 AECU-4156

Argonne National Lab., Lemont, Ill.

THE USE OF LOW LEVEL SCINTILLATION SPECTROSCOPY IN THE EVALUATION OF RADIOACTIVE CONTAMINATION OF THE HUMAN BODY. C. E. Miller, H. A. May, and L. D. Marinelli. [1958]. 30p. Contract [W-31-109-eng-38]. $1.00 (OTS).

The use of NaI(Tl) scintillation spectroscopy has been extended successfully to the appraisal of the gamma radiation emitted by radioelements present in the human body, both in its normal state and in the presence of contamination levels well below those accepted as maximum permissible under industrial exposure. Design criteria to be met by the detector and the shield of an instrument adequate for these purposes are discussed from theoretical and practical points of view. Special attention has been given to the analysis of the background spectrum as it is affected both by the natural radioactivity of the apparatus and its surroundings, and by the action of cosmic-rays ionizing particles and showers. General and special measuring techniques, based on spectral analysis, are described in detail as they concern the localization, identification, and quantitation of various radioelements either distributed throughout the whole body or localized in some of its organs. An outline is given of a coincidence summing technique capable of measuring, without recourse to chemical procedures, about 10^{-11} c of either the U^{238} or Th^{232} chain in equilibrium in the presence of potassium gamma-ray activities higher by three orders of magnitude; possible uses of this technique are briefly mentioned. (auth)

15460 AFCRC-TN-58-623

Air Force Cambridge Research Center. Geophysics Research Directorate, Mass.

VENTING OF HOT GASES THROUGH TEMPERATURE INVERSIONS. GRD Research Notes No. 3. Mariano A. Estoque. Dec. 1958. 17p. (AD-160756).

The penetration of temperature inversions in the lower atmosphere by plumes of hot air is investigated as part of a safety analysis in the nuclear aircraft program. This problem is studied with the aid of existing theoretical as well as experimental work. A nomogram showing the relationship between the maximum height attained by a hot plume of a given heat source intensity and the temperature gradient of the environment is presented. The limitations of existing knowledge on the problem are pointed out and some recommendations for future research are made. (auth)

15461 APEX-460 (Rev.)

General Electric Co. Aircraft Nuclear Propulsion Dept., Cincinnati.

STEADY-STATE AND TRANSIENT THERMAL STRESSES IN A TUBE SUBJECTED TO INTERNAL HEATING. H. A. Eagle and A. L. Ross. Oct. 1955. 32p. Contracts AF33(600)-38062 and AT(11-1)-171. $1.00 (OTS).

A method of solution is presented for thermal stresses caused by either steady-state or transient heat flow in an internally heated tube. The heat conduction equations are solved by the method of finite differences and are programmed for solution by high-speed digital computers. By coding the problem for computers of this type, thermal stresses for tubes of different materials, thermal properties, and heat-generation histories are readily attainable. (auth)

15462 APEX-480

General Electric Co. Aircraft Nuclear Propulsion Dept., Cincinnati.

THERMAL STRESS ANALYSIS OF FINITE SECTIONS. Arthur L. Ross. Jan. 20, 1959. 16p. Contracts AF33 (600)-38062 and AT(11-1)-171. $0.50 (OTS).

A general method is described for finding the thermal stresses in finite, simply connected regions. The method is applicable to plane-stress or plane-strain problems and makes use of the analogy between the problems of the bending stresses of clamped plates and those of thermal-plane stresses. The thermal stresses in simply connected sections are shown to be analogous to the bending stresses developed in thin, flat plates of the same dimensions clamped along their edges and loaded by a surface pressure distribution determined from the temperature distribution of the original thermal-stress problem. For the particular cases in which the temperature distribution is parabolic, or in which the temperature distribution arises from the two-dimensional thermal distribution caused by uniform heat generated in the cross section, the thermal stresses can be found by analogy with a thin plate clamped at the edges and loaded by a uniform surface pressure. The method is applied to rectangular cross sections where, although the solution to the plate-bending problem is still complicated, it is most advantageous since a great amount of work has been done in developing solutions for clamped-plate bending. (auth)

15463 CRFD-835
Atomic Energy of Canada Ltd., Chalk River, Ont.
$\int k d\theta$ IN FUEL IRRADIATIONS. J. A. L. Robertson. Apr. 1959. 27p. (AECL-807). $1.00(AECL).

The parameter, $\int k d\theta$, is being increasingly used to describe the condition of reactor fuels under irradiation. The mathematical derivation of the equations by which the parameter can be measured, for simple geometries, is provided. Some of the possible applications are discussed; by way of illustration, three numerical examples are included. (auth)

15464 HW-48891
General Electric Co. Hanford Atomic Products Operation, Richland, Wash.
SUMMARY OF GRAPHITE DIFFUSION LENGTH STUDIES AT HANFORD. E. D. Clayton. Mar. 5, 1957. 30p. Contract [W-31-109-Eng-52]. $6.30(ph), $3.00(mf) OTS.

A short summary of the diffusion length studies in graphite which have been made at Hanford are presented. The diffusion length as measured in the Hanford Standard Pile was 54.4 ± 0.5 cm. when corrected to a graphite density of 1.6 g/cm^3. A series of diffusion length measurements were taken in graphite stacks of various sizes. The effect of air channels on diffusion length is described. The diffusion length in a pure moderator can be determined from a measurement in a slightly poisoned moderator if the effect of the poison can be properly accounted for. A comparison is made of the diffusion lengths in Hanford reactors with Σ pile and exponential pile measurements. The variation of diffusion length with temperature is described. (W.L.H.)

15465 HW-59046
General Electric Co. Hanford Atomic Products Operation, Richland, Wash.
RADIAL THERMAL FLUX TRAVERSES IN NATURAL URANIUM-GRAPHITE LATTICES. R. Nilson and T. J. Oakes. May 25, 1959. 19p. Contract [W-31-109-Eng-52]. $4.80(ph), $2.70(mf) OTS.

The data presented have been obtained over the past few years at Hanford to enable improvements to be made in lattice parameter calculations. The thermal detectors were 60 mil diameter by 250 mil long $Al-U^{235}$ alloy pins. The U^{235} serves as very nearly a 1/v detector. The first eight curves represent the detailed radial flux traverses in the fuel elements. The last seven curves depict the traverses throughout the entire cell, including the U. The measurements were made in some cases with three different coolants in the coolant channels-air, water, and MIPB. (W.L.H.)

15466 KAPL-M-HS-4(Rev.)
Knolls Atomic Power Lab., Schenectady, N. Y.
COMPARISON OF Hf, Hf-B10, AND Fe-B10 CONTROL SLABS. H. E. Stevens. May 5, 1955. 8p. Contract W-31-109-Eng-52. $1.80(ph), $1.80(mf) OTS.

Flat plate, Y-shaped, and cross rods are considered for pressurized water reactors. These are forms made from plates or slabs. The thermal effectiveness of $^3/_{16}$ in. thick hafnium control slabs, the effectiveness of boron-10 additions to the hafnium, and the quantity of B-10 necessary in steel slabs were determined. These slabs are compared to the ideal black absorbing slab at 70°F by the absorption area method, and by the more common one-collision method which neglects the reflection of transmitted neutrons by the surrounding medium. (auth)

15467 LA-2277
Los Alamos Scientific Lab., N. Mex.
A NUMERICAL SOLUTION OF A SPHERICAL BLAST WAVE UTILIZING A COMPLETELY TABULAR EQUATION OF STATE. Leland R. Stein. June 1958. 47p. Contract W-7405-eng-36. $1.50(OTS).

Using an equation of state of air in completely tabular form, a one dimensional, spherically symmetric blast wave calculation was numerically carried out. An IBM 704 computer was utilized for the calculation. The Rankine-Hugoniot conditions at the shock front and the isentropic changes of the shocked fluid were determined by iterative methods. The numerical methods employed are discussed in some detail, as are the details of the equation of state. The initial starting conditions for this numerical integration were those of Problem M. The numerical results are presented in graphical form. Comparison to Problem M is also displayed graphically. The comparison to Problem M is good, the small differences being attributed to that of equation of state and finite differencing methods. (auth)

15468 NASA-M-6-4-59W
National Bureau of Standards, Washington, D. C.
AERODYNAMIC HEATING AND FATIGUE. Wilhelmina D. Kroll. June 1959. 30p.

A review of the physical conditions under which future airplanes will operate has been made and the necessity for considering fatigue in the design has been established. A survey of the literature shows what phases of elevated-temperature fatigue have been investigated. Other studies that would yield data of particular interest to the designer of aircraft structures are indicated. (auth)

15469 NP-7615
Joint Inst. for Nuclear Research, Dubna, U.S.S.R. Lab. of Theoretical Physics.
A PROOF OF SOME DISPERSION RELATIONS IN QUANTUM FIELD THEORY. V. S. Vladimirov and A. A. Logunov. 1959. 24p.

Dispersion relations for some inelastic processes are proved by Bogolubov's method using the Jost-Lehmann-Dyson integral representation for casual commutators. (auth)

15470 NP-7618
Joint Inst. for Nuclear Research, Dubna, U.S.S.R. Lab. of Theoretical Physics.
APPLICATION OF FOURIER METHOD TO THE SOLUTION OF INVERSE PROBLEM IN SCATTERING THEORY. V. K. Melnikov. 1958. 14p.

The problem of reconstructing the potential function of the Schroedinger equation using the spectral properties of its solutions is called an inverse problem of scattering theory. Strict mathematical solution of this problem for the case of central symmetrical field was given in papers by several investigators. All these papers are based on the fact that the spectral characteristic is known for all values of the parameter K of the Schroedinger equation. Physically speaking it means that it is necessary to know the results of scattering experiments of all energies. In the real physical situation it may be known for a finite energy interval. This investigation gives a means for the reconstruction of the low-frequency harmonics of the potential and wave functions by the limiting phase of the S-scattering known for the finite energy interval. The stability of this process is shown. (A.C.)

15471 NP-7619
Joint Inst. for Nuclear Research, Dubna, U.S.S.R. Lab. of Theoretical Physics.
EQUATION FOR THE WAVE FUNCTION OF THE N-PARTICLE SYSTEM IN THE MANY-BODY PROBLEM. V. G. Solov'ev (Soloviev). 1959. 6p.

The method suggested by N. N. Bogolubov makes it possible to take into account N-particle correlations in the problem where the total number of particles $N \gg N$, i.e., essentially, to take into account N-particle correlations in the medium. In the present investigation this method for obtaining an equation for the wave function of the N-particle system in the many body problem is used, taking into consideration its application to the processes in which the correlations of many particles play an important part. (A.C.)

15472 NRL-5249
Naval Research Lab., Washington, D. C.
ATMOSPHERIC RADIOACTIVITY STUDIES AT THE U.S. NAVAL RESEARCH LABORATORY. L. B. Lockhart, Jr., R. A. Baus, P. King, and I. H. Blifford, Jr. Nov. 12, 1958. 15p. Project NR-571-000. (AD-210053).

Information obtained since 1948 relative to the levels of some of the principal radioactive constituents of the normal atmosphere and traces the long-term changes that have occurred in the fission product concentration in the air at a number of sites in the Northern Hemisphere is summarized. Since the start of the IGY program much information has become available in gross fission product levels at various sites along the 80th meridian (west) from Antarctica to Greenland. Radiochemical analysis of material from the various collecting sites has resulted in considerable information on the air concentration of such long-lived radioisotopes as Ce^{144}, Sr^{90}, Cs^{137}, and Pb^{210} and on "stratospheric hold-up," which is confirmed by the presence at all collecting sites of unusually high percentages of the long-lived radioactive material from past large-yield nuclear explosions. At no place studied does the fission product concentration add any significant amount to the total radioactivity of the air. (auth)

15473 NYO-4526
Columbia Univ., New York.
FILTRATION OF MONODISPERSE SOLID AEROSOLS. PART I. FILTRATION OF UNCHARGED SOLID AEROSOL PARTICLES. PART II. FILTRATION OF CHARGED SOLID AEROSOL PARTICLES. Aug. 27, 1953. 89p. Contract AT(30-1)-1434. $15.30(ph), $5.40(mf) OTS.

Preparation of a monodisperse solid multiwax aerosol and a method for pneumatic dispersion of iron powder into an aerosol consisting of single spherical particles are reported. In addition, a new form of charging device design is described, from which all departing particles are charged. The filtration of multiwax aerosols through CC5 filter paper was studied, and it was found that the logarithm of the penetration (P) is proportional to the time of filtration for uncharged aerosol; also log P is proportional to the radius of the uncharged particle at low velocities. The logarithm of penetration of charged particles was not proportional to the particle radius. At applied charging potentials of 5 and 6 kv, a maximum penetration was found at a particle size of 0.3 micron radius; this value is higher than the corresponding value for uncharged aerosol. (J.R.D.)

15474 ORNL-2740
Oak Ridge National Lab., Tenn.
ELECTRONUCLEAR RESEARCH DIVISION ANNUAL PROGRESS REPORT FOR PERIOD ENDING OCTOBER 1, 1958. June 18, 1959. 47p. Contract W-7405-eng-26. $1.50(OTS).

A wide range of nitrogen-induced nuclear reactions was investigated with the ORNL 63-inch Cyclotron. Reactions in which only one particle is emitted are found to be more probable than would be expected. The angular distributions of the light particles emitted are being investigated, and studies are being made of the scattering of incident nitrogen ions. The 23-Mev protons from the ORNL 86-inch Cyclotron are being used in investigations of the details of proton scattering from various elements, of proton-induced fission, and of nuclear levels excited in nuclei of the rare earths. The successful operation and predictable performance of the 200-kev electron cyclotron have served to validate extensive theoretical studies of ion orbits and the optical properties of azimuthally varying magnetic fields (AVF). A second cyclotron analogue is being designed to accelerate electrons to ~ 500 kev in an eight-sector spiral AVF magnet. A feasibility study was completed for the construction of a variable-energy, three-sector, azimuthally-varying-field, 76-in., fixed-frequency cyclotron designed to accelerate various particles with e/m ratios from 1 to 0.125 over a wide range of energies, including protons to 75 Mev. The new machine is to be known as the Oak Ridge Relativistic Isochronous Cyclotron (ORIC). (For preceding period see ORNL-2434.) (auth)

15475 SCR-82
Sandia Corp., Albuquerque, N. Mex.
EVOLUTION OF ENVIRONMENTAL TESTING. R. S. Hooper. May 1959. 29p. Contract [AT(29-1)-789]. $4.80(ph), $2.70(mf) OTS.

Presented at Inst. of Environmental Engineers [Meeting], Chicago, April 1959.

A brief discussion is presented of the progress over the last seven years of the environmental laboratory at Sandia Corporation. (W.L.H.)

15476 SCTM-21-59(16)
Sandia Corp., Albuquerque, N. Mex.
TRANSMISSION OF NEUTRONS BY CYLINDRICAL DUCTS PENETRATING RADIATION SHIELDS. J. R. Barcus. Mar. 25, 1959. 20p. $0.75(OTS).

After a brief introduction to elementary neutron transport theory, the problem of the transmission of neutrons by straight and bent cylindrical ducts penetrating a radiation shield is considered. The direct scattered component is treated to a first approximation using the diffusion approximation applied to the distribution of effective anisotropic sources along the duct wall. The geometric approximations are such that the method is applicable mainly to ducts with diameter-to-length ratios small compared to unity. (auth)

15477 SCTM-432-58(51)
Sandia Corp., Albuquerque, N. Mex.
ESTIMATED NUCLEAR EXPLOSIVE REQUIREMENTS FOR CANAL EXCAVATION. L. J. Vortman, B. F. Murphey, J. W. Reed, R. H. Carlson, and M. E. Schellenbaum. Nov. 1958. 12p. Contract [AT(29-1)-789]. $3.30(ph), $2.40(mf) OTS.

A procedure for estimating the yields, depths of burst, and spacings of nuclear explosives for canal excavation is presented. (auth)

15478 SCTM-450-58(51)
Sandia Corp., Albuquerque, N. Mex.
MINIMUM YIELD OF NUCLEAR EXPLOSIVE REQUIRED FOR CANAL EXCAVATION. R. H. Carlson, B. F. Murphey, M. E. Schellenbaum, and L. J. Vortman. Dec. 1958. 24p. Contract [AT(29-1)-789]. $0.75(OTS).

The results of a computer program for determining the minimum yield of spaced nuclear explosive charges required to excavate a canal 600 feet wide at 60 feet below sea level are presented. These are applied to the Sassardi route across the Isthmus of Panama and indicate that a canal could be constructed with 619 units, the total yield of which is 33.75 MT. The cost of the nuclear explosive is estimated at less than one-half billion dollars. If the cost of placement equalled that of the explosive, the saving in a project estimated to cost four billion dollars if done by conventional methods is significant. (auth)

15479 TID-4005(Pts. 3-4)
Division of Research, AEC.
SUMMARIES OF PHYSICAL RESEARCH IN PHYSICS AND MATHEMATICS. May 1959. 109p. $1.00(OTS).

General objectives are given of each research project carried on under AEC contracts to "off-site" institutions. The program involves 100 contracts to 54 institutions in the general areas of: high-energy physics, nuclear structure and neutron physics, extra-nuclear properties of matter, design and development of research devices, physical methods of isotope separation, and mathematical research and computer development. (T.R.H.)

15480 UCRL-5519-T
California. Univ., Livermore. Lawrence Radiation Lab.
THEORETICAL ANALYSIS OF THE HYDRODYNAMIC FLOW IN EXPLODING WIRE PHENOMENA. Carl A. Rouse. Mar. 1959. 47p. Contract W-7405-eng-48. $7.80(ph), $3.30(mf) OTS.

Theoretical calculations of exploding wire phenomena were carried out with an IBM 704 Lagrangian code. The model for this analysis assumes instantaneous energy deposition in the wire. Calculations were made with various conditions, including different effective equations of state for the copper wire and different equations of state for the surrounding air. The equations of state for the air include a constant gamma-law gas and the variable gamma-law gas calculated by F. R. Gilmore. The shock wave propagation in each is shown to require significantly different energies. The results are compared with calculations made without copper wire (energy assumed deposited in a volume of air equal to that of the wire) and with an analytic similarity solution for cylindrical shock waves. The propagation of the shock wave in air calculated with the Gilmore equation of state for air shows excellent agreement with that observed by F. D. Bennett. The second shock wave in the copper shows qualitative agreement with that observed by Bennett, but indicates that in the range of EWP, copper does not act like a constant gamma-law gas. As for similarity, it is shown that hydrodynamic flow during the explosion of wires is not similar. (auth)

15481 USCEC-56-205
University of Southern California., Los Angeles. Engineering Center.
SOME PROBLEMS IN HYDROMAGNETICS. K. P. Chopra. Jan. 31, 1959. 220p. Contract AF18(603)-95. (AFOSR-TN-59-265; AD-212468).

Expressions for the translational and rotational induction drags of a magnetic sphere in a conducting fluid are derived subject to the restriction that the induced currents do not seriously modify the original magnetic field appreciably. This restriction is not valid for large bodies. The anisotropic character of the induction drag is also evident from the analysis. It is found that the velocity profile of an electrically conducting liquid flowing in a circular pipe transforms itself from a parabola into a plateau as a magnetic field of increasing strength is applied transverse to the flow direction. Properties of current-driven (i) force-free and pressure-bound hydrostatic magnetic fields and (ii) the decaying modes of the magnetic field, (where the decay is due to ohmic losses only) in a fluid sphere and an infinite cylinder are studied. The possibilities of time-independent magnetic fields are also explored. The change in magnetic energy of a fluid sphere with a prevalent current-driven magnetic field is calculated for P_1-deformation. It is found that the equilibrium configuration is an oblate spheroid for a poloidal magnetic field, and it is a prolate spheroid for a toroidal magnetic field. Integral formula for the radial adiabatic pulsations of an infinite cylinder with electric currents flowing in its interior is obtained. A problem similar to 'Tunnel Effect' dealt with. It is shown that Alfvén waves may be transmitted across a barrier strip of zero inertia if the thickness of the strip is of the order of the wave length. The effect of the transverse magnetic field on the internal energy, enthalpy, entropy, specific heats, and the speed of sound is considered. The analogue of Prandtl's relation is derived and the conditions determining the nature of the fluid flow are obtained therefrom. The nonrelativistic propagation of plane hydromagnetic shock waves in a medium of infinite electrical conductivity is described. (auth)

15482 WADC-TN-57-347
Wright Air Development Center. Aeronautical Research Lab., Wright-Patterson AFB, Ohio.
THERMAL AND EPITHERMAL NEUTRON ACTIVATION IN A THICK STEEL SLAB. R. D. Schamberger and A. N. Fasano. Oct. 1957. 22p. Project No. 7112. (AD-142060).

The activation of gold, indium, and nickel foils by neutrons originating in a fission source was investigated within a nine-inch steel slab and in water and polyethylene following the steel. The measurements indicate a large epithermal activation in the steel so that the insertion of layers containing boron at the boundaries of the steel effected only a small reduction in the activation. The activation data in polyethylene and water indicate that hydrogen dominates the attenuation process for only the first eight inches of the polyethylene. Beyond eight inches the relaxation length as indicated by subcadmium neutron data is the same in polyethylene as in water. (auth)

15483 WADC-TR-59-119
Wright Air Development Center. Materials Lab., Wright-Patterson AFB, Ohio.
REMOVAL DOSE AS AN ENVIRONMENTAL MEASUREMENT OF X-RAYS AND GAMMA RAYS. [Period covered] May through December 1958. R. L. Hickmott. Feb. 1959. 37p. Project and Task title: NUCLEAR INSTRUMENTATION. (AD-211918).

Removal dose is found to have a solid historical tradition dating back to the original formulation of the Bragg-Gray principle. Removal dose is a simple concept, is expressed in simple units, and is useful over a large range of photon energies. Absorbed dose is readily derived from Removal dose. Removal dose is just as closely related to radiation effects as is Absorbed dose if geometry effects are negligible. Additional support is found for Carbon dose as a minimum environmental measurement. But it is pointed out that Carbon dose is a special kind of Removal dose (Removal dose carbon), and that radiation effects in some materials may be more accurately monitored by Removal dose (or Absorbed dose) in a different material than carbon. This suggests the use of ion chambers and calorimeters of various materials. If these are used, the Absorbed dose or Removal dose in these materials could be reported as the environmental measurement or converted to the basic Absorbed dose Sample. (auth)

15484 WAPD-TM-162
Westinghouse Electric Corp. Bettis Plant, Pittsburgh.
HERD 1, 2, AND 3—IBM-704 CODES USED TO SOLVE THE ONE-DIMENSIONAL, ONE-VELOCITY TRANSPORT EQUATION WITH ISOTROPIC SCATTERING. Louis A. Hageman. Jan. 1959. 20p. Contract AT-11-1-GEN-14. $0.75 (OTS).

The HERD codes furnish a numerical approximation to the one-dimensional, single energy transport equation in slab geometry. The primary purpose of HERD 2 and 3 is to compute blackness coefficients. The limitations of the codes are given and the preparation of input described. (auth)

15485 WAPD-TM-168
Westinghouse Electric Corp. Bettis Plant, Pittsburgh.
BLACKNESS THEORY AND COEFFICIENTS FOR SLAB GEOMETRY. C. W. Maynard. May 1959. 92p. Contract AT-11-1-GEN-14. $15.30 (ph), $5.40 (mf) OTS.

"Blackness theory" is described as a class of procedures for matching a high order transport approximation in one region to a low order approximation in a second region. The matching conditions are presented as a generalization of the Marshak boundary conditions. The blackness coefficients necessary in setting up the conditions are defined and tables are given for slab geometry. A method which allows all regions to be treated by means of the blackness coefficients is developed and applied to two region cells. Numerical results are compared with other approximations in situations typical of those encountered in resonance capture and thermal utilization calculations. (auth)

15486 AEC-tr-3693
MACROSCOPIC ASPECT OF BRIEF AND INTENSE DISCHARGES IN GASES. (Aspect Macroscopique des Decharges Breves et Intenses dans les Gaz.)
I. Podliasky. Translated for Oak Ridge National Lab. from CEA report, IP-15. 23p. (Includes original, 9p.). $4.80 (ph), $2.70 (mf) JCL.

An attempt is made to extend Toepler's law for the resistance of spark gaps in air to all very brief and powerful gaseous discharges, regardless of the method of production, the gas, the pressure, and the temperature. The only conditions for its validity are the extreme brevity and the extreme intensity of the discharge. (W.D.M.)

15487 AEC-tr-3694
ON THE SKIN EFFECT IN A TRANSITORY SYSTEM. (Sur l'Effet de Peau en Regime Transitorie.)
I. Podliasky. Translated for Oak Ridge National Lab. from Report CEA-211. 33p. (Includes original, 18p.). $6.30 (ph), $3.00 (mf) JCL.

The formation of electric current in a cylinder of high conductivity and large radius is examined by studying the behavior of peripheral layers near the metal–insulation space separation. At the moment of application, the distribution of the current is purely superficial, and at the end of the transitory phenomena, the density becomes uniform again. The study is conducted mathematically, and it is shown that the inductance during application of the electric field does not vary more than 10%, while resistance decreases by many orders. (J.R.D.)

15488 AEC-tr-3695
WEAK AND STRONG DISCHARGE SYSTEMS IN GASES. (Regimes Faible et Fort d'une Decharge dans les Gaz.) I. Podliasky. Translated for Oak Ridge National Lab. from report, CEA-210. 26p. (Includes original, 15p.). $4.80 (ph), $2.70 (mf) JCL.

In the case where the column contains only electrons, the Coulomb action dominates and, instead of contracting, the column will be in a state of centrifugal expansion. The presence of a certain number of positive ions is absolutely necessary to provoke stricture in order to partially compensate the Coulomb effect. This proposal is established using the figures and notation of IP-14. (W.D.M.)

15489 AEC-tr-3698
MICROWAVE CONFINEMENT OF A PLASMA IN A SPHERICAL WALLED CAVITY. (Confinement par Micro Ondes d'un Plasma Dans une Cavite a Parois Spheriques.) T. Consoli. Translated for Oak Ridge National Lab. from CEA report, CEN-S-PA-7771. 14p. (Includes original, 7p.). $3.30 (ph), $2.40 (mf) JCL.

An approximate calculation related to the confinement of plasmas by microwaves in a cavity of double spherical walls is presented. The plasma constitutes the central spherical nucleus. The internal wall of the cavity is produced by the skin effect while the external wall is a second spherical metal surface. Specifications of the U.H.F. generators and power oscillators required for confinement are given. (J.R.D.)

15490 AEC-tr-3700
INTENSE MAGNETIC FIELDS—TABLE OF THE PRINCIPAL RESULTS OBTAINED. (Champs Magnetiques Intenses—Tableau des Principaux Resultats Obtenus.) P. Ricateau. Translated for Oak Ridge National Lab. from CEA report, CEN-S-PA-7791. 2p. $1.80 (ph), $1.80 (mf) JCL.

A tabular compilation of the principal characteristics of intense magnetic fields is presented. References are included. (J.R.D.)

15491 AEC-tr-3703
FUNDAMENTALS OF TOEPLER'S LAW AND ITS EXTENSION. (Fondements de la Loi de Toepler et l'Extension de Celle-Ci.) M. Podliasky. Translated for

Oak Ridge National Lab. from CEA report, IP-16. 27p. (Includes original, 15p.). $4.80(ph), $2.70(mf) JCL.

A more general and correct form of Toepler's law is given which seems to be applicable to all sufficiently brief and intense discharges in gases. An attempt is made at a "microscopic" justification of the formula which was experimentally established by Toepler. The hypotheses with which it is possible to support Toepler's law are explained thoroughly. This leads to a more correct form and delimits the area of application. (auth)

15492 AEC-tr-3727
MICROGRAPHY AND ELECTRONIC MICRODIFFRACTION OF THIN SECTIONS OF URANIUM. Adrien Saulnier and Paul Mirand. Translated by Margaret V. Colven (Savannah River) from Compt. rend. 247, 2351-4 (1958). 4p. $1.80(ph), $1.80(mf) JCL.

A simple technique is given which allows preparation from massive samples of uranium some slices which are thin enough to be observed directly on the electronic microscope. Some micrographies and plates of microdiffraction show that these slices are composed essentially of metal and are covered by only a thin film of oxide. (auth)

15493 AERE-Trans-825
THE STATE OF IONISATION AND RADIATION FROM IMPURITY GASES IN A HYDROGEN PLASMA. G. Knorr. Translated by J. B. Sykes (U.K.A.E.A., Atomic Energy Research Establishment) from Z. Naturforsch. 13a, 941-50(1958). 18p.

An interpolation formula for ionization (and excitation) of ions is proposed, which holds for the whole energy range of the colliding electrons. With the aid of this formula a time constant is computed and discussed which characterizes the time scale of the establishment of ionization equilibrium of the heavier ions. Elwert's ionization formula is generalized for small parameters $s = \chi_n/kT$, where χ_n is the ionization energy. The radiation of impurities (free-free, free-bound and excitation radiation) is computed and discussed for such a plasma. The interaction of the radiation with the plasma is neglected. In research on thermonuclear fusion in quasi-steady conditions, the energy loss by radiation from the plasma is of importance. This radiation loss for a pure non-relativistic hydrogen plasma, neglecting electron-electron radiation has been calculated. In practice, the hydrogen plasma is never pure, but always contains some impurities in the form of heavier atoms arising from impurity of the hydrogen, residual gases in the vacuum, and emissions of gas from the walls during the experiment. Impurities are sometimes added intentionally in order to derive information about the temperature of the plasma from its radiation. The first part of this paper is intended to help in answering the question to what extent the electron temperature of the plasma can be deduced from the degree of ionization and the impurity radiation, especially at times shortly after heating the plasma. The second part is concerned with radiation energy loss through the impurities. (auth)

15494 CEA-tr-A-276
MESURES D'EXPLOSIONS DE FILS A L'AIDE DU COMPTEUR GEIGER-MÜLLER. (Measurement of the Wire Explosions with the Aid of Geiger-Mueller Counter.) O. Balk. Translated into French by P. Monnard from Naturwissenschaften 43, 511(1956). 3p.

The existence of high-intensity radiation after a wire explosion has been reported by W. H. Conn. The experiments were repeated using Cu and Ag wires having a length between 5 and 50 mm and diameters from 0.05 to 0.2 mm. The battery of condensers was charged to 17 kv. A halogen-quenched Geiger counter with an end window having a thickness of 0.2 mg/cm^2 was used to measure the radiation. No increase of the counting rate was observed after the wire explosion. (J.S.R.)

15495 CEA-tr-A-513
L'ABSORPTION OPTIQUE, L'ÉMISSION PHOTOÉLECTRIQUE ET THERMIQUE ET LA VARIATION DE LA CONDUCTIBILITÉ EN FONÇTION DE LA TEMPÉRATURE DES COUCHES DE CESIUM-BISMUTH DE DIFFÉRENTES COMPOSITIONS. (Optical Absorption, Photoelectric and Thermal Emission, and the Variation of Conductivity as a Function of the Temperature of Layers of Cesium—Bismuth of Different Composition.) H. G. Clerc and G. Wallis. Translated into French from Ann. Physik 19, 344-52(1957). 21p.

Optical, electrical, and photoelectrical measurements of cesium—bismuth layers of different composition were made. While the energy level of the absorption constant can only be indicated by its higher limit, the thermal and photoelectrical energies and the activation energy of the electric conductivity are determined and discussed in relation with the possible models of bond bands. The absorption of layers of pure bismuth was measured in the range from 400 to 2200 mμ and the results are compared with previous measurements. (tr-auth)

15496 NP-tr-250
APPARATUS FOR PRODUCING HIGH PULSED MAGNETIC FIELDS. V. R. Karasik. Translated for Lincoln Lab., MIT from Pribory i Tekh. Ekspt. No. 1, 142-5(1959). 8p. $1.80(ph), $1.80(mf) JCL or LC.

This paper was previously abstracted from the original language and appears in NSA, Vol. 13, as abstract No. 11147.

15497 TT-801
THERMAL CONDUCTIVITY OF POROUS AND PULVERULENT MATERIALS. A THEORETICAL STUDY. (Conductibilité Thermique des Matériaux Poreux et Pulverulents. Etude Theorique.) G. Ribaud. Translated by G. Gavrel (National Research Council of Canada) from Chaleur & ind. 18, 36-43(1937). 24p.

The mechanism of thermal conductivity in porous materials in which interposed layers of air play an important part is discussed. (auth)

15498

VAPOR PRESSURE MEASUREMENTS OVER CALCIUM, MAGNESIUM, AND THEIR ALLOYS AND THE THERMODYNAMICS OF FORMATION OF $CaMg_2$. J. F. Smith (Iowa State Coll., Ames) and R. L. Smythe (Texas Instruments, Inc., Dallas). Acta Met. 7, 261-7(1959) Apr.

Vapor pressures were measured by the Knudsen effusion method over magnesium, calcium, and a series of calcium—magnesium alloys. Magnesium vapor pressures are in good agreement with previous work. Calcium vapor pressures are in reasonable agreement with previous measurements over liquid calcium but do not reproduce any of the past measurements over solid calcium. Vapor pressure measurements over the alloys were used to determine the free energy of formation of the compound, $CaMg_2$. The free energy of formation in kcal/mole can be expressed as $\Delta F^\circ = -8.3 + (1.1 \times 10^{-3})T$. The small values for the enthalpy and entropy of formation are consistent with the view that the compound forms because of atomic size considerations. An independent check on the enthalpy of formation was made by bomb calorimetry. (auth)

15499

LOW-FREQUENCY OSCILLATIONS IN A GLOW DISCHARGE. Vaclav Krejčí (Czechoslovak Academy of Sciences, Prague). Czechoslov. J. Phys. 7, 509-10 (1957). (In Czech.)

Experimental investigations of the glow discharge wave layer parameters uncovered some low-frequency oscillations with stationary layers. The discharge parameters in such instances oscillate synchronously along the whole discharge. Such oscillations can be induced by a sudden jump in the discharge current or by a strong voltage pulse at the external electrode. The typical oscillograms of such oscillations are described. (R.V.J.)

15500

EFFECTS OF X RADIATION ON COPPER OXIDE CONDUCTIVITY. Radomír Kužel (Charles Univ., Prague). Czechoslov. J. Phys. 7, 767-8(1957). (In Czech.)

The effects of x irradiation on the conductivity of copper oxides at 75 and 147°C were analyzed. The temperature and irradiation intensity dependence of the current saturation is shown graphically. (R.V.J.)

15501

AN ALGORITHM OF QUANTUM MECHANICS. I. S. Arzhanykh (Lenin Middle-Asia State Univ.). Doklady Akad. Nauk S.S.S.R. 126, 45-8(1959) May 1. (In Russian)

An attempt was made to develop a universal algorithm which in one realization describes the equations of classical mechanics and in another realization the equations of quantum mechanics. Hence, a synthesis can be derived as the difference and the relation between the first and second realizations. (R.V.J.)

15502

GREEN'S RETARDED AND ADVANCED FUNCTIONS IN STATISTICAL PHYSICS. N. N. Bogolyubov and S. V. Tyablikov (Steklov Inst. of Math., Academy of Sciences, U.S.S.R.). Doklady Akad. Nauk S.S.S.R. 126, 53-6(1959) May 1. (In Russian)

An approximation method is outlined for resolving problems in statistical physics, based on the analysis of Green's two-dimensional retarded and advanced functions, with the application of the Lehmann-Callen spectral representation. (R.V.J.)

15503

A SHOCK WAVE WITH A GAS CONDUCTIVITY JUMP IN AN ELECTROMAGNETIC FIELD. G. A. Lyubimov (Lomonosov Moscow State Univ.). Doklady Akad. Nauk S.S.S.R. 126, 291-4(1959) May 11. (In Russian)

A stationary shock wave with an incoming stream of non-conducting gas (conductivity $\sigma_1 = 0$) was investigated. The parameters of the incoming stream in front of the wave and the intensity of electric and magnetic fields, which are taken as parallel to the shock wave plane, are given. Behind the shock wave the gas conductance is considered infinite ($\sigma_2 = \infty$). The relations for shock waves expressing the mass conservation law, pulse, energy, and tangent of the electric field component are derived. The given shock wave can be obtained as the range of a certain continuous stationary solution for the equations of magnetic hydrodynamics with alternating conductance, when the magnetic field rises in transition through the shock wave. (R.V.J.)

15504

CALCULATIONS OF THE NUCLEAR QUADRUPOLE COUPLING CONSTANT FOR I_2. D. V. G. L. Narasimha Rao (Andhra Univ., Waltair, India). Indian J. Phys. 33, 103-6(1959) Mar.

Certain theoretical studies on the quadrupole coupling constant of I^{127} in I_2 are made following the general principles of Townes and Dailey (1949). The I—I bond is assumed to be one of a covalent type. Effects of sp-hybridization are considered and the results indicate the possibility of considerable amount of hydridization of the bonding orbitals. (auth)

15505

A NOTE ON THE DEPENDENCE OF THE SPUTTERING PRODUCED BY BOMBARDMENT BY CANAL RAYS ON THEIR ANGLE OF IMPACT. V. T. Chiplonkar and B. N. Varadrajan (Inst. of Science, Bombay). Indian J. Phys. 33, 127-34(1959) Mar.

The sputtering produced by bombardment of metal targets with canal rays was observed to consist of two types I and II, appearing in the two characteristic angular regions of 0^0 to 20^0 and 30^0 to 90^0, respectively (with respect to the incident beam). There is evidence to show that the magnitude of sputtering as well as the angular intensity distribution in type I (which appears to be the significant one involved in the sputtering of wires) show a definite dependence on the angle of impact, thus indicating that it involves a momentum transfer mechanism. (auth)

15506

ARTIFICIAL MODIFICATION OF THE EARTH'S RADIATION BELT. S. F. Singer (Univ. of Maryland, College Park). J. Astronautical Sciences 6, 1-10(1959).

To calculate the length of time and origin of particles trapped in the earth's magnetic field, an experiment is suggested for injecting artificially accelerated particles directly into the radiation belt region and measuring their rate of diffusion. The method discussed consists of carrying a small electron accelerator aloft in either a satellite or high altitude rocket and firing daily sounding rockets to measure the residual activity. (W.D.M.)

15507

ON THE COEFFICIENTS OF IRREVERSIBLE PROCESSES IN A HIGHLY IONIZED GAS. Taro Kihara (Univ. of Tokyo). J. Phys. Soc. Japan 14, 402-10(1959) Apr.

An effective interparticle potential, which is a modified Debye-Hückel potential, is introduced and discussed in order to eliminate simultaneous interactions between three particles or more in an ionized gas. For this potential weak-interaction asymptotes of collision cross sections necessary for the theory of irreversible processes are calculated without making further approximations. These cross sections are applied to relaxation between ion and electron temperatures and to the coefficient of viscosity. (auth)

15508

EFFECT OF ELECTRON BOMBARDMENT OF SODIUM CHLORIDE. Shigetomo Yoshida and Toshio Ikeda (Tohoku Univ., Sendai, Japan). J. Phys. Soc. Japan 14, 473-7(1959) Apr.

The absorption spectra ranging from 360 to 960 mμ

were measured on rock salt crystals bombarded with electrons at various temperatures. Three types of color centers, namely F, 590 mμ, and colloidal centers were formed as a function of specimen temperature during bombardment. The thermal bleaching of these three color centers was also investigated. From these results it is supposed that the color center with an absorption peak at about 590 mμ may correspond to a precursor of colloidal sodium. It is also suggested that there may be a correlation between coloration and dissociation of sodium chloride by electron bombardment. (auth)

15509

NUCLEAR MAGNETIC DOUBLE RESONANCE EXPERIMENT ON TWO PROTON SYSTEM. Junkichi Itoh and Riichiro Kusaka (Osaka Univ.). J. Phys. Soc. Japan 14, 492-8(1959) Apr.

Nuclear magnetic double resonance studies were done on two proton systems in $K_2HgCl_4 \cdot H_2O$ single crystals. Applying a strong r-f field with the frequency nearly equal to that of one line in the doublet of two proton resonance, the line shape of the other line of the doublet was measured for various values of the intensity and frequency of the strong r-f field. Generally, the observed line shape shows further doublet structure, and the separation and relative intensities of this doublet depend upon the intensity and frequency of the field. Some calculations were made for the line structure of two proton system under the influence of a strong r-f field. The experimental results agree qualitatively with the calculation, but there exist some discrepancies in the absolute magnitudes of the splitting of the induced doublet. (auth)

15510

ON THE DIAMAGNETISM OF GRAPHITE. I. ENERGY LEVELS OF π-ELECTRONS. Hisanao Sato (Nagoya Univ., Japan). J. Phys. Soc. Japan 14, 609-17(1959) May.

The energy levels of the conduction electrons in graphite, in the presence of a magnetic field, are calculated by the method of the tight binding approximation, taking into account the effect of band-to-band transitions which is not included in the Landau-Peierls treatment. The present theory is a natural extension of the Luttinger-Kohn and McClure theories for the band structure of graphite. The relation to the diamagnetic susceptibility is discussed. (auth)

15511

THEORY OF SPATIALLY GROWING PLASMA WAVES. Masao Sumi (Electrical Communication Lab., Tokyo). J. Phys. Soc. Japan 14, 653-7(1959) May.

The linearized theory of spatially growing waves in a uniform plasma is investigated in detail. By solving the dispersion relation in this case, characteristics of excited waves are presented. Behaviors of the growth rate and the phase velocity of the amplified wave are examined in connection with the frequency and various conditions of the medium plasma and the directed beam. It is seen that the theory is in good agreement with some features of experimental results. (auth)

15512

A VISUALIZING METHOD OF ELECTRON TEMPERATURE AND PLASMA DENSITY. Hajime Tamagawa and Junji Fujita (Univ. of Tokyo). J. Phys. Soc. Japan 14, 678(1959) May.

Electron temperatures as well as plasma densities of a transient plasma can be visualized directly on the pattern of a cathode-ray tube. The principle is based on Langmuir's single probe method. Electron temperature is obtained by differentiating a logarithm of the probe current with respect to the probe potential. Then, if the probe potential is changed linearly with time, electron temperature is given by the ratio of probe current to its time derivative. (L.T.W.)

15513

SOME OBSERVATIONS ON NUCLEAR MAGNETIC RESONANCE USING SUPER-REGENERATIVE OSCILLATOR TECHNIQUE. E. V. Raghunadha Rao (Andhra Univ., Waltair, India). J. Sci. Ind. Research (India) 18b, 125-6(1959) Mar.

A 6 to 10 Mc/s conventional Hartley oscillator with sinusoidal quench voltage of 2 to 17 Kc/s. applied to the grid of the valve has been utilized. The sample, contained in a small glass cell, is located in the inductance of the tank circuit of the oscillator and is placed in between the poles of a Max-Kohl electromagnet with a 50 c/s. modulation field. Both receiver and audio detection methods were employed. The signal height over the noise level was measured on the negatives of the oscillograms taken by the audio detection method. (W.L.H.)

15514

FLUORESCENCE SPECTRA OF URANYL PERCHLORATE SOLUTIONS AT ROOM TEMPERATURE. D. D. Pant and D. P. Khandelwal (D.S.B. Government Coll., Naini Tal, India). J. Sci. Ind. Research (India) 18B, 126-7(1959) Mar.

The spectrum at room temperature was found to consist of a single series of α-bands which were unaffected by dilution. No change was noticed in the spectrum upon adding excess perchloric acid. The wavelengths of the α- and β-bands observed in uranyl perchlorate and nitrate solutions are given. (W.L.H.)

15515

DEMOUNTABLE VACUUM SEAL FOR OPERATION AT TEMPERATURES FROM –188°C TO 800°C. R. Brymner and W. Steckelmacher (Edwards High Vacuum, Ltd., Crawley, Sussex, Eng.). J. Sci. Instr. 36, 278-81(1959) June.

A new type of metal gasket vacuum seal is described which depends on a surface-friction effect instead of compression, which is the basis of most seals. Tests proved the effectiveness of the seal for repeated cycling between –188 and 800°C on flanges of 3 and 5 in. diameter and on a ½ in. vacuum union. The materials used include mild steel or stainless-steel flanges with flat gasket sheets of soft copper, iron, stainless steel, or nickel. Other metal gasket vacuum seals are briefly reviewed and the mechanism of sealing is discussed. A table of recommended dimensions for flanges from 3 to 12 in. diameter is also presented. (auth)

15516

BAKEABLE VACUUM SEALS USING ALUMINIUM-WIRE GASKETS. J. Holden, L. Holland, and L. Laurenson (Edwards High Vacuum, Ltd., Crawley, Sussex, Eng.). J. Sci. Instr. 36, 281-3(1959) June.

The use of aluminum wire as a vacuum seal between steel flanges was studied. Gaskets made by twisting together the ends of a 22 s.w.g. wire could be baked to 200°C before they leaked on cooling. High-temperature working was possible with butt-welded loops of aluminum wire providing the gasket was highly compressed. Such seals did not cold weld but, at baking temperatures above 400°C, the aluminum plastically flowed and adhered to the mating flanges. The "cemented" joint was vacuum tight at low and high temperatures (20 – 550°C) although the securing bolts became loose after baking. Such a seal leaked only when the aluminum reached its melting point. Information is given on the minimum compression force which must be applied to an aluminum wire in order to form a cemented joint at elevated temperature. Several uses of the aluminum-wire seal are described. (auth)

15517

COULOMB DEFLECTION EFFECTS ON IONIZATION AND PAIR-PRODUCTION PHENOMENA. Jens Bang and Johannes M. Hansteen. Kgl. Danske Videnskab. Selskab. Mat.-fys. Medd. 31, No. 13, 1-43(1959).

The process of K-ionization of atoms by heavy, charged particles is analyzed by a semi-classical, time-dependent perturbation method. Non-relativistic wave functions are used for the atomic electrons. The deflection of the bombarding particle in the Coulomb field of the target nucleus is shown to play an important part in the calculation of cross sections in the low-energy region of the projectile. Numerical calculations of K-ionization cross sections for protons turn out to be in good agreement with recent light-target experiments. An estimate is made of the effect of using relativistic electron wave functions in the present perturbation treatment. The method developed is further applied to the pair-production process caused by slow protons impinging on a heavy target element. (auth)

15518

TOP SCIENTISTS FIND ARGUS OPENING NEW AVENUE OF EXPERIMENTATION. Charles D. LaFond. Missiles and Rockets 5, No. 20, 37, 40, 43-4, 47, 49(1959) May 18.

A summary of the whole series of events known as the Argus experiment is presented. Brief descriptions of the history, original proposal, and initial planning are given. Observations and results are discussed in some detail. (W.D.M.)

15519

ENERGY LEVELS OF LIGHT NUCLEI. VI. F. Ajzenberg-Selove (Haverford Coll., Penna.) and T. Lauritsen (California Inst. of Tech., Pasadena). Nuclear Phys. 11, 1-340(1959) May (2).

Energy levels, masses, and Q-values are tabulated for nuclei up through Ne^{24}. An annotated bibliography is included. (T.R.H.)

15520

DOUBLET SPLITTINGS IN NUCLEI AND THE STRONGLY CORRELATED NUCLEAR WAVE FUNCTIONS. J. Sawicki and R. Folk (Princeton Univ., N. J.). Nuclear Phys. 11, 368-86(1959) May (3).

The nucleon-nucleus LS coupling is calculated using the Brueckner type of theory and the strongly correlated nuclear core density obtained from Jastrow's theory applied to the finite nucleus. The two-body potentials are replaced by the two-body scattering operators calculated from the potentials of Gammel and Thaler and of Signell and Marshak. It was possible to avoid many approximations often made in calculations of this type and thus some important correction to the leading Thomas-like term is included. The general theory is applied to the O^{17} problem with Dabrowski variational trial functions of O^{16} to calculate the core density. Both the correct sign and the correct order of magnitude of the doublet splitting of O^{17} are obtained for both two-body potentials, and so this theory provides no clear distinction between these potentials. (auth)

15521

THE THEORY OF n–d SCATTERING WITH TENSOR FORCES. L. M. Delves and D. Brown (Auckland Univ., N. Z.). Nuclear Phys. 11, 432-43(1959) May (3).

The scattering of neutrons by deuterons at energies below 3.5 Mev was investigated in an approximation including the effects of both the tensor force and the distortion of the deuteron by the neutron. The distortion is found to be small at these energies in the doublet state, but not in the quartet state. Angular distribution and polarization curves for the neutron are given as a function of energy, and the second order spin moment of the deuteron calculated at 3.25 Mev neutron energy. Agreement with experiments where these exist is reasonable. Polarizations of the order of 10% are predicted. (auth)

15522

ON THE ORDERED-EXPONENTIAL SOLUTIONS FOR THE THIRRING MODEL. F. L. Scarf (CERN, Geneva). Nuclear Phys. 11, 475-8(1959) May (3).

The explicit solutions for the Thirring model obtained by Glaser and Pradhan are shown to be equivalent when the latter is defined by a suitable limiting process. It is found that they lead to identical expressions for the wave function renormalization constant and for the invariant Green's functions. (auth)

15523

HANDLING CURIE LEVELS OF BETA-GAMMA ACTIVE SOLUTIONS. J. H. Moss, G. P. Kitt, and P. E. Brown (Atomic Energy Research Establishment, Harwell, Berks, Eng.). Nuclear Power 4, No. 38, 120-1(1959) June.

Equipment and techniques developed for working with concentrates containing up to 1 curie/ml are described. The work consisted of general solution chemistry on the milliliter scale. (T.R.H.)

15524

THE TRANSMISSION OF NEUTRONS IN MULTILAYERED SLAB GEOMETRY. Herbert S. Wilf (Nuclear Development Corp. of America, White Plains, N. Y.). Nuclear Sci. and Eng. 5, 306-19(1959) May.

The use of the method of discrete ordinates as a numerical tool in reactor calculations is described. A scheme for the numerical integration of the discrete ordinate equations is developed, and the results compared with known exact solutions. The problem of reflection and transmission of neutron beams in stratified slab geometry is considered from the point of view of the method of discrete ordinates. A matrix formalism is derived which permits the calculation of transmitted and reflected distributions if the incident beam is given. Asymptotic expressions for the relevant matrices are given, and comparison is made with the work of Chandrasekhar. Tables of the matrix elements in the P_7 approximation are presented. (auth)

15525

ON THE 3d WAVE FUNCTIONS IN ATOMS OF THE IRON GROUP. I. Fidone (Istituto di Fisica dell'Universita, Palermo, Italy). Nuovo cimento (10) 11, 736-7(1959) Mar. 1.

Among the parameters which appear in the theory of the hyperfine structure and quadrupole interaction of the iron transition group, there is the average value of r^{-3} for the 3d shell. Theoretical calculations of average values of r^{-3} have been made, but a wave function accurate at short distances from the nucleus is needed. A method of calculation is evolved and values of r^{-3} are calculated for Sc, Ti, V, Cr, Mn, Fe, Co, Ni, and Cu and compared with experimental values. (T.R.H.)

15526

A POSSIBLE EXPERIMENTAL TEST OF THE RELATIVE PARITY OF CHARGED AND NEUTRAL K's. G. Morpurgo (Istituto di Fisica dell'Università, Parma, Italy and Istituto Nazionale di Fisica Nucleare, Frascati, Italy). Nuovo cimento (10) 11, 738-9(1959) Mar. 1.

A practically feasible experiment is pointed out which should be appropriate to decide whether charge symmetry in K interactions is violated and whether such violation, if it exists, has to be attributed to a parity difference. (T.R.H.)

15527

PROBABILITY DENSITY OF ELECTRON SEPARATION IN A UNIFORM ELECTRON GAS. N. H. March and W. H. Young (The University, Sheffield, Eng.). Phil. Mag. (8) 4, 384-9(1959) Mar.

A method of approach to the correlation problem in a uniform electron gas, within the framework of density matrix theory, is discussed. (auth)

15528

ON THE DERIVATION OF COSMIC RAY SPECIFIC YIELD FUNCTIONS. W. R. Webber and J. J. Quenby (Imperial Coll. of Science and Tech., London). Phil. Mag. (8) 4, 654-64(1959) May.

A series of revised differential response curves and yield functions have been deduced for the nucleonic and ionizing components of the secondary cosmic radiation at various atmospheric depths, using the most recent data on the primary spectrum and on geomagnetic cutoff rigidities. (auth)

15529

HALL EFFECT OF THORIUM. F. Boeschoten (Reactor Centrum Nederland, The Hague) and K. J. Groenewolt (Rijksuniversiteit, Utrecht). Physica 25, 398(1959) May.

An a-c method using primary currents of ~1 amp was employed in determining the Hall effect in Th. A value of -1.4×10^{-12} volt-cm/gauss-amp or -1.4×10^{-10} m^3/coulomb was found for a 21 μ thickness. No dependence on field strength between 4000 and 10,000 gauss was observed. Resistivity measured by a d-c method was 19×10^{-8} ohm meters. A strong temperature dependence was found for the Hall effect in Th by varying the temperature from 25 to 400°C. (T.R.H.)

15530

MEASUREMENTS OF WEAK MAGNETIC FIELDS BY ELECTRON RESONANCE METHOD. A. K. Chirkov (Ural Polytechnic Inst.). Pribory i Tekh. Ekspt. No. 2, 36-8(1959) Mar.-Apr. (In Russian)

The feasibility of using organic radicals and sodium solutions in liquid ammonia for measuring weak heterogeneous magnetic field intensity at 0.4 to 21 gauss is described. The order of error is 1 to 0.01%. (tr-auth)

15531

THE STRIPPING REACTION OF He^3 AND ALPHA PARTICLES. M. El-Nadi and M. El-Khishin (Cairo Univ.). Proc. Phys. Soc. (London) 73, 705-12(1959) May.

Recent experimental data on the (He^3,p) differential cross section showing forward and backward peaks are interpreted as due to the He^3 particle stripping and heavy particle stripping, respectively. Reasonable agreement is obtained between the derived theoretical formulae and the experimental data. Some (d,α) reactions are interpreted in a similar way. (auth)

15532

NEGATIVE IONS IN THE POSITIVE COLUMN OF THE OXYGEN DISCHARGE. J. B. Thompson (Univ. College, London). Proc. Phys. Soc. (London) 73, 818-21(1959) May.

The concentration of negative ions in the positive column of an oxygen discharge has been measured by a Langmuir probe technique. It is shown how the negative ions affect the ambipolar diffusion and potential distribution in such a plasma. (W.L.H.)

15533

THE HEAT CONDUCTIVITY AND VISCOSITY OF LIQUID HELIUM(II). D. F. Brewer and D. O. Edwards (Univ. of Oxford). Proc. Roy. Soc. (London) A251, 247-64(1959) May 26.

Measurements have been made in glass capillary tubes of 52 and 108 μ diameter, in the temperature range from 1.15 to 2.15°K. For sufficiently small temperature gradients the thermal resistance is independent of the heat flow and is caused solely by the viscosity of the normal fluid, η_n. This viscosity has been calculated from the measured thermal resistance data with the use of the existing entropy values, and the results from the two tubes are in very good agreement except for a small deviation at low temperatures which is attributed to slip. The viscosity at the saturated vapor pressure, when corrected for slip, agrees closely with the results obtained by the rotating cylinder viscometer but does not agree with the oscillating disk experiments. The variation of η_n at low temperatures follows the theory of Landau & Khalatnikov if Δ/k is taken as 8.9°K, but the measured values of the slip correction are slightly larger than would be expected from the theoretical phonon and roton mean free paths. In the 52 μ tube the measurements have been extended up to the solidification pressure so as to give η_n as a function of density. Near the lambda line η_n increases rapidly with density, but at low temperatures the variation is quite small and it is found that the contribution from the rotons is almost independent of density. (auth)

15534

A COMPARATIVE STRUCTURAL STUDY OF CRACKING CATALYST, POROUS GLASS, AND CARBON PLUGS BY SURFACE AND VOLUME FLOW OF GASES. R. M. Barrer and T. Gabor (Imperial Coll., London). Proc. Roy Soc. (London) A251, 353-68(1959) June 9.

Transient and steady states of volume and surface flow of gases and vapors in microporous media require for their description four different diffusion coefficients, namely, a surface and a gas-phase coefficient for transient and a surface and gas-phase coefficient for steady flow. The distinction between steady and transient flow arises in part because of the role of blind pores. Similarly, two different porosities ϵ and ϵ_s and two different surface areas A and A_s govern transient and steady-state flow respectively. By comparing the two gas-phase and the two surface diffusion coefficients with gas-phase and surface diffusion coefficients in a smooth cylindrical capillary having ϵ/A equal to that for the porous medium, four structure factors can be defined, in terms of which the pore properties of microporous media can be discussed. Data are presented for sorption, transient flow (time lag) and steady flow of He, Ne, A, and N_2 in compressed alumina-silica catalyst plugs. These, and previously obtained data for Vycor porous glass and Carbolac carbon plugs have been analyzed according to the above procedure, and pore properties compared. In this way it was possible to obtain information regarding pore structure which could not have been derived by other methods. (auth)

15535

ON THE UNSTABLE STATES IN QUANTUM FIELD THEORY. Tetsui Gotō (Nihon Univ., Tokyo). Progr. Theoret. Phys. (Kyoto) 21, 1-17(1959) Jan.

The unstable state in quantum field theory is investigated. Its properties are studied in detail by making use of Lee's model. The renormalization procedure is proposed and the corresponding Z-factor has values only between zero and unity. In the limit of g (the coupling constant) = 0, the Z-factor becomes unity in contrast to Naitō's Z-factor which becomes one-half. (auth)

15536

SPECTRUM AND STRUCTURE OF TRIVALENT EUROPIUM IN EUROPIUM BROMATE. H. G. Kahle (Technische Hochschule, Darmstadt, Ger.). Z. Physik 155, 129-44(1959). (In German)

The absorption spectrum of a single sector of the pseudohexagonal crystal was measured in the temperature range from 68 to 290°K. The theoretical analysis proved earlier was improved and completed. The essential points are that the point symmetry of the Eu^{3+} ion in the lattice, in the temperature range studied, is C_S, in very good approximation, with the monoclinic axis perpendicular to the pseudohexagonal crystal axis and parallel to the other prism surface. The deviations from the hexagonal symmetry were larger with decreasing temperature. The single sectors are not formed homogeneously but possess a mosaic structure for which a model is given. From the term splitting the real matrix elements of the crystal field energy were determined. The phase of a complex matrix element was established from the intensity of the magnetic dipole moment. The intensity of the electric dipole radiation increases with decreasing temperature. (tr-auth)

15537

ZEEMAN EFFECT OF TRIVALENT EUROPIUM IN EUROPIUM BROMATE. H. G. Kahle (Technische Hochschule, Darmstadt, Ger.). Z. Physik 155, 145-56 (1959). (In German)

The Zeeman effect of the visible absorption spectrum was investigated at 201°K with high resolution. The line displacements observed can be completely described by a first approximation perturbation calculation with the pseudomonoclinic crystal field and the external magnetic field as perturbation of the Eu ions. From the Zeeman displacements, the phase of a complex matrix element of the crystal field was determined. The g factors of the excited terms $^5D_1$ and $^5D_2$ were determined as $g = 1.46 \pm 0.035$. The mosaic structure of the europium bromate was completely confirmed through the Zeeman effect. (tr-auth)

15538

ZEEMAN EFFECT OF TRIVALENT EUROPIUM IN EUROPIUM CHLORIDE, $EuCl_3 \cdot 6H_2O$. H. G. Kahle (Technische Hochschule, Darmstadt, Ger.). Z. Physik 155, 157-69(1959). (In German)

The Zeeman effect of the visible absorption spectrum of the monoclinic europium chloride was investigated at 77°K and was completely explained by a first approximation perturbation calculation. From the line displacements observed the place of the magnetic transition dipole was determined relative to the indicatrix. The g factors of the excited terms $^5D_1$ and $^5D_2$ are $g = 1.43 \pm 0.04$ and $g = 1.44 \pm 0.05$, respectively. The difference of the g factors in various europium salts is related to a noticeable intermixture of the states of free ions by crystal fields and magnetic fields. From the directional dependence of the Zeeman effect, it is concluded that the point symmetry C_2 of the Eu^{3+} ions in the lattice is D_6, in good approximation, with the hexagonal axis perpendicular to the monoclinic axis. The direction of the pseudohexagonal axis was not established. (tr-auth)

15539

COINCIDENCES CAUSED BY COMPTON BACKSCATTERING OF GAMMA-RAYS. Hsu Yung-chang and Cheng Lin-sheng. Wu Li Hsüeh Pao 14, 114-20(1958). (In Chinese)

With slight improvement of an ordinary Rossi circuit, a coincidence circuit with resolving time of 1.5×10^{-7} sec was built. Using this instrument, the annihilation radiations of small component β^+-rays emitted by Zn^{65} were investigated under various experimental conditions. The experiments demonstrate that the 0.21 Mev γ-rays found previously by some authors in Zn^{65} may be the backscattered γ-rays due to 1.12-Mev γ-rays of Zn^{65}. Moreover, the coincidence rate of collimated annihilation radiations gives the percentage of β^+-decay of Zn^{65} per total disintegration as $(1.5_6 \pm 0.1_6)\%$. (auth)

15540

WAVE FUNCTIONS AND POLARIZATION STATES OF A TWO-PHOTON SYSTEM. Wang̀ Yung. Wu Li Hsüeh Pao 15, 55-62(1959). (In Chinese)

All the wave functions of a two-photon system with definite angular momentum and parity are found, and the polarization states of photons are systematically analyzed. The imperfections in the discussions of Yang, Shirokov, and Shapiro are clarified. (auth)

15541

THE BEHAVIOR OF OXIDE CATHODES IN LOW PRESSURE DISCHARGE. Bernhard Kühl. Thesis, Technischen Universität, Berlin-Charlottenburg, [1959]. 24p. (In German)

Stability conditions for the arc ignition on the oxide cathode in low-pressure discharge were derived from the power balance of the cathode. Stabilization of the arc with and without focusing was considered. The behavior of the oxide cathodes in low pressure glow discharge was investigated by a measurement of the intensity of the spectral lines of evaporated barium excited in negative glow discharges. (J.S.R.)

15542

ELECTRIC CONTACT MEANS. J. W. Grear, Jr. (to U. S. Atomic Energy Commission). U. S. Patent 2,877,314. Mar. 10, 1959.

A switch adapted to maintain electrical connections under conditions of vibration or acceleration is described. According to the invention, the switch includes a rotatable arm carrying a conductive bar arranged to close against two contacts spaced in the same plane. The firm and continuous engagement of the conductive bar with the contacts is achieved by utilizing a spring located between the bar and the arm frame and slidably mounting the bar in a channel between two arms suspended from the arm frame.

15543

LOGARITHMIC AMPLIFIER. E. J. Wade and R. S. Stone (to U. S. Atomic Energy Commission). U. S. Patent 2,877,348. Mar. 10, 1959.

Electronic amplifier circuits, especially a logarithmic amplifier characterized by its greatly improved stability, are discussed. According to the invention, means are provided to feedback the output voltage to a diode in the amplifier input circuit, the diode being utilized to produce the logarithmic characteristics. The diode is stabilized by a second diode connected in series opposition therewith and having its filament operated from the same source as the filament of the logarithmic diode. A bias current of relatively large value compared with the signal current is continuously passed through the compensating diode to render the diode insensitive to variations in the signal current. By this arrangement any voltage changes in diodes due to variation in the filament power will be cancelled, so that the stability of the amplifier will be unimpaired.

15544

NON-DESTRUCTIVE METHOD AND MEANS FOR FLAW DETECTION. R. Hochschild (to U. S. Atomic Energy Commission). U. S. Patent 2,877,406. Mar. 10, 1959.

An improved method is presented for the non-destructive detection of flaws in electrically conductive articles using a magnetic field. According to the method a homogeneous magnetic field is established in the test article, at right angle to the article. A probe is aligned with its axis transverse to the magnetic field and the test article is rotated and translated so that the probe scans the surface of the test article while the axis of the probe is transverse to the direction of translation of the article. In this manner any output current obtained in the probe is an indication of the size and location of a flaw in the article under test, with a minimum of signal pick-up in the probe from the established magnetic field.

15545

INSPECTION MEANS FOR INDUCTION MOTORS. A. W. Williams (to U. S. Atomic Energy Commission). U. S. Patent 2,877,408. Mar. 10, 1959.

An apparatus is described for inspecting electric motors, and more especially an apparatus for detecting faulty end rings in squirrel-cage induction motors while the motor is running. In its broad aspects, the invention utilizes a current transformer wound around one stator lead of the motor, a source of reference current, and phase detector means connected to measure the phase angle between the current of the reference source and the stator. The phase detector means also indicates the amplitude of the pulsations in the phase angle which is a measure of the condition of the end rings in the motor.

15546

BINARY EXCESS-3 CONVERTER. C. M. Kenrich and B. L. Crew (to U. S. Atomic Energy Commission). U. S. Patent 2,877,447. Mar. 10, 1959.

An electronic circuit for conversion of excess-3 binary coded serial decimal numbers to straight binary coded serial decimal numbers is reported. The converter of the invention in its basic form generally comprises an input circuit adapted to receive excess-3 coded pulse words of a type having an $\underline{x}$ algebraic sign digit followed serially by a plurality of decimal digits in order of decreasing significance preceding a $\underline{y}$ algebraic sign digit followed serially by a plurality of decimal digits in order of decreasing significance. A switching matrix is coupled to said input circuit and is internally connected to produce serial straight binary coded pulse groups indicative of the excess-3 coded input. A stepping circuit is coupled to the switching matrix and to a synchronous counter having a plurality of $\underline{x}$ decimal digit and plurality of $\underline{y}$ decimal digit indicator terminals. The stepping circuit steps the counter in synchronism with the serial binary pulse group output from the switching matrix to successively produce pulses at corresponding ones of the $\underline{x}$ and $\underline{y}$ decimal digit indicator terminals. The combinations of straight binary coded pulse groups and corresponding decimal digit indicator signals so produced comprise a basic output suitable for application to a variety of output apparatus.

15547

PRECISION TIME-DELAY CIRCUIT. R. Creveling (to U. S. Atomic Energy Commission). U. S. Patent 2,878,382. Mar. 17, 1959.

A time-delay circuit which produces a delay time in the order of microseconds is described. The circuit arrangement of the invention includes a capacitor, an inductance, and a diode having a finite back resistance, connected serially with the anode of the diode going to ground. At the start of the time delay a negative step-function is applied to the series circuit and initiates a half-cycle transient oscillatory voltage terminated by a transient oscillatory voltage of substantially higher frequency. The output of the delay circuit is taken at the junction of the inductor and diode where a sudden voltage rise appears after the initiation of the higher frequency transient oscillations.

15548

HIGH VOLTAGE GENERATOR. A. J. Schwemin (to U. S. Atomic Energy Commission). U. S. Patent 2,878,401. Mar. 17, 1959.

A generator is presented for producing relatively large currents at high voltages. In general, the invention comprises a plurality of capacitors connected in series by a plurality of switches alternately disposed with the capacitors. The circuit is mounted for movement with respect to contact members and switch closure means so that a load device and power supply are connected across successive numbers of capacitors, while the other capacitors are successively charged with the same power supply.

15549

PUMPS. J. D. Thornton (to U. S. Atomic Energy Commission). U. S. Patent 2,879,144. Mar. 24, 1959.

A pump is described for conveying liquids, particularly chemical process liquids, where it is not advisable to use moving mechanical parts in the apparatus. The pump comprises an injector adapted to be submerged in the liquid to be pumped, a conduit extending from the high-velocity nozzle of the injector, and means for applying a pulsating pressure to the surface of the liquid in the conduit, whereby the surface oscillates between positions in the conduit. During the positive half-cycle of an applied pulse liquid is forced through the high velocity nozzle or jet of the injector and operates in the manner of the well known water injector and pumps liquid from the main intake to the outlet of the injector. During the negative half-cycle of the pulse liquid flows in reverse through the jet but no reverse pumping action takes place.

15550
ANNULAR IMPACTOR SAMPLING DEVICE. G. W. C. Tait (to U. S. Atomic Energy Commission). U. S. Patent 2,879,664. Mar. 31, 1959.

A high-rate air sampler capable of sampling alpha-emitting particles as small as 0.5 microns is described. The device is a cylindrical shaped cup that fits in front of a suction tube and which has a sticky grease coating along its base. Suction forces contaminated air against the periodically monitored particle absorbing grease.

Elementary Particles

15551 AD-208421
Minnesota. Univ., Minneapolis. School of Physics.
THE FLUX AND ENERGY SPECTRUM OF COSMIC RAY α-PARTICLES DURING SOLAR MAXIMUM. P. S. Freier, E. P. Ney, and C. J. Waddington. Dec. 1958. 40p. Contract Nonr-710(19).

The fluxes of primary cosmic α particles over Minnesota and Texas were measured during the present period of maximum solar activity. A value of 136 ± 9 α particles/m^2 sec ster was measured over Minnesota and of 68 ± 4 α particles/m^2 sec ster over Texas. In both cases these values are significantly lower than those observed at solar minimum. The energy spectrum was determined between 200 Mev/nucleon and 3.0 Bev/nucleon. Results show that the slope of the integral spectrum is less than that observed at solar minimum and that a significant number of low energy particles is still present. A possible mechanism for these changes is discussed briefly. The determination of energies of particles from a measurement of their ionization is discussed in detail. (auth)

15552 AFOSR-TN-59-490
New Mexico. Univ., Albuquerque.
ON THE RESPONSE OF A SINGLE LARGE SCINTILLATOR TO EXTENSIVE AIR SHOWERS. John R. Green. May 4, 1959. 26p. Contract AF49(638)-34. (AD-215943).

Good experimental evidence of the lateral structure of extensive air showers has become available together with theory that correctly predicts the observed distribution. Improved techniques in the manufacture of photomultiplier tubes has made it possible to construct scintillators of very large acceptance area. These circumstances have suggested the possibility of investigating the behavior of extensive air showers using but a single scintillator in place of many smaller ones. An investigation was made in an effort to predict, applying the known properties of extensive air showers, the response of such a scintillator. (A.C.)

15553 NP-7616
Joint Inst. for Nuclear Research, Dubna, U.S.S.R. Lab. of Theoretical Physics.
AZIMUTHAL SYMMETRIES IN CASCADES OF REACTIONS AND PARITY CONSERVATION. M. I. Shirokov. 1959. 15p.

Some angular azimuthal symmetries resulting from parity conservation were obtained for the cascades from reactions of the triple-proton-scattering type. It is shown that the experimental evidence of the simplest, well-known symmetry of secondarily scattered particles with respect to the plane of primary scattering is not an exhausting check of parity conservation. The proposed experiments may be a more fundamental verification of this law and in some cases even a complete one. (auth)

15554 NP-7617
Joint Inst. for Nuclear Research, Dubna, U.S.S.R. Lab. of Theoretical Physics.
FORM FACTOR INFLUENCE ON PROCESSES OF BREMSSTRAHLUNG AND PAIR PRODUCTION ON PROTONS. P. S. Isaev and I. S. Zlatev. 1959. 24p.

The differential cross sections of the processes of electron bremsstrahlung and pair production by γ quanta on protons in the presence of the form factor were calculated. This calculation was made in the lower order of the perturbation theory. The formula of the differential bremsstrahlung cross section was integrated over all angles, except the angle between the direction of the incident electron and that of emitted photon. The comparison of the differential and integral cross sections of the bremsstrahlung with the corresponding Bethe-Heitler formulas was made. (auth)

15555 NP-7620
Joint Inst. for Nuclear Research, Dubna, U.S.S.R. Lab. of Nuclear Problems and Joint Inst. for Nuclear Research, Dubna, U.S.S.R. Lab. of Theoretical Physics.
ON THE INVESTIGATION OF PION-HYPERON INTERACTION. L. I. Lapidus and Chzhou Guan-chzhao. 1959. 10p.

It is shown that the unitarity of the S matrix makes it possible to obtain some information on pion-hyperon scattering by analysis of the data on K meson—nucleon interactions. The possibility of investigating $\pi-\Lambda$ and $\pi-\Sigma$ interactions in studying the peripheral collisions of hyperons with nucleons is explored. (A.C.)

15556 NP-7621
Joint Inst. for Nuclear Research, Dubna, U.S.S.R. Lab. of Nuclear Problems.
ON A METHOD APT TO SEARCH FOR ρ^0 MESONS. A. D. Konin, S. M. Korenchenko, B. Pontecorvo, and V. G. Zinov. 1959. 5p.

The principle and possibilities of a method for searching for ρ^0 mesons are discussed. The method consists in searching for a relatively narrow anomaly in the energy dependence of the ρ^--p cross section, inasmuch as such an anomaly would in principle give evidence of the existence of ρ^0 mesons. (A.C.)

15557 NP-7636
Princeton Univ., N. J.
A COUNTER-CLOUD CHAMBER INVESTIGATION OF K^+ MESONS PRODUCED IN COSMIC RAYS (thesis). Technical Report No. 23. Herbert Gursky. May 26, 1959. 122p. Contract Nonr-1858(06).

An experiment was carried out in which stopping K^+ mesons were observed in a multiple cloud chamber. Simultaneously the decay lifetimes of the particles were recorded by associated electronic components. The cloud chamber was triggered when one scintillation counter recorded a delay coincidence with respect to another counter within a time interval of 15 to 115 mμ

sec. Out of 26,000 cloud chamber pictures taken in this manner, there were found 76 events which are interpreted as the decay of K^+ mesons at rest. Seventeen of these events have secondary decay products which come to rest in the chamber. These secondaries fall into two distinct range groups; one at 80.0 gm/cm², the other at 46.9 gm/cm² of Cu. If these groups are interpreted as resulting from the decay of the $K^+_{\mu 2}$ and the $K^+_{\pi 2}$, respectively, masses of 495 ± 16 Mev and 500 ± 15 Mev for the two particles are obtained. The mean lifetime of the entire ensemble of data was determined to be $13.5^{+3.5}_{-1.5}$ mμ sec. The K^+ mesons were seen to be associated with very low multiplicity events, and only five events were accompanied by four or more penetrating particles. The production is discussed on the basis of cross sections obtained from machine data which extends to 3 Bev. It is found that only ⅓ of the observed events can be produced at energies below 3 Bev, and the remainder can readily be obtained by extrapolating the cross section data to 6 Bev under the assumption that all the production takes place via intermediate pions. (auth)

15558 NP-7637

Princeton Univ., N. J. Palmer Physical Lab. and Princeton Univ., N. J. Naval Ordnance Lab.
COMPARISON OF THE STRANGE PARTICLE PRODUCTION IN CLOUD CHAMBERS WITH THE OBSERVATIONS OF DECAY γ-RAYS NEAR INTERNAL COSMOTRON TARGETS. Technical Report No. 24. Theodore Bowen. June 25, 1959. 31p. Contract Nonr-1858(06).

The cloud chamber results of the Princeton and M.I.T. groups and the γ-counting results of Berley and Collins on the production of strange particles by 2.7-2.9-Bev protons appear to agree very satisfactorily. Both the absolute comparison of numbers of γ counts from C, Fe, and Pb and the relative comparison of the shapes of the decay curves support a consistent interpretation, making use of currently accepted values of lifetimes and decay branching ratios. The γ-counting results cannot directly reveal the relative contributions from Λ^0's and θ_1^0's. (W.D.M.)

15559 ORNL-2705

Oak Ridge National Lab., Tenn.
THEORY OF RESONANCE ABSORPTION OF NEUTRONS IN A LUMP. K. Hasegawa. June 18, 1959. 35p. Contract W-7405-eng-26. $1.25(OTS).

A new integral equation governing the slowing down of neutrons in a lump, assuming a spatially uniform neutron flux inside it, is derived. In the first approximation the equation is solved using the asymptotic energy dependence of the neutron flux and a new resonance integral formula is proposed. In the limit of both the narrow resonance and the wide resonance, the formula tends to be equal to that derived in the conventional narrow and wide resonance approximations. In the second approximation the effects of the deviation of the Placzek function from its asymptotic form is calculated by a method similar to that used by Weinberg and Wigner for homogeneous systems. It is shown that the resonance integrals of the usual narrow and wide resonance approximations become equal for a certain value of Γ_n/Γ, irrespective of the resonance width. Some numerical results are given. (auth)

15560 UCRL-8737

California. Univ., Berkeley. Lawrence Radiation Lab.
ANGULAR DISTRIBUTIONS IN Σ^+ DECAY. Jack Leitner, Paul Nordin, Jr., Arthur H. Rosenfeld, Frank T. Solmitz, and Robert D. Tripp. Apr. 23, 1959. 8p. Contract W-7405-eng-48. $0.50(OTS).

Angular distributions in Σ^+ decay are analyzed for information on Σ spin and parity conservation in Σ production. No evidence for a Σ spin >½ or parity nonconservation in Σ production is found. (auth)

15561

INTERACTIONS BETWEEN MATTER AND RADIATION IN FUNCTIONAL THEORY. Jean-Louis Destouches and Pham Xuân Yêm. Compt. rend. 248, 2959-61(1959) May 25. (In French)

The movement of an electron in an electromagnetic field with a large number of photons is studied in functional theory. The equations of a system of photons and of the electron are given. Between the equations for the two particles there are coupling terms which show, in a certain sense, their mutual influence. It is shown that the electromagnetic potentials created by a large number of photons are equal, with a probability of 1, to potentials associated with the mean wave of the photons which act on the electron. (J.S.R.)

15562

ON THE ANISOTROPY OF A HETEROGENEOUS MEDIUM WITH RESPECT TO THE DIFFUSION OF NEUTRONS. [PART] I. Ladislav Trlifaj, Czechoslovak Academy of Sciences, Prague). Czechoslov. J. Phys. 7, 397-409(1957).

Equations are derived for the diffusion of monoenergetic neutrons in a stratified heterogeneous medium. The neutron sources are plane and are located at infinity. The problem of homogenization and anisotropy of the heterogeneous medium is solved on the assumption of microscopic isotropy of scattering of the neutrons. The problem is solved generally (general position of the source, and active and inactive medium). (auth)

15563

AURORAL X-RAYS, COSMIC RAYS, AND RELATED PHENOMENA DURING THE STORM OF FEBRUARY 10-11, 1958. J. R. Winckler, L. Peterson, R. Hoffman, and R. Arnoldy (Univ. of Minnesota, Minneapolis). J. Geophys. Research 64, 597-61(1959) June.

Balloon observations were made during the auroral storm of February 10-11, 1958, at Minneapolis. Strong x-ray bursts in two groups were detected. The groups appeared coincident with two large magnetic bays, with strong radio noise absorption, and with the passage across the zenith of a very large amount of auroral luminosity. From the x-ray intensity and measured energies, an electron current of 0.6×10^6 electrons/cm²/sec was present. These electrons ionizing the upper D layer accounted for the increased cosmic noise absorption. The x-rays themselves carried 1000 times less energy than the electrons and could not provide sufficient ionization for the observed radio absorption. Visual auroral forms during this storm are reported to have lower borders at the 200 to 300 km level. There is thus a difficulty in bringing the electrons to the D layer without an accompanying visible aurora. A cosmic-ray decrease accompanied the storm and was observed to be from 4 to 6% at sea level, 21% in the balloon altitude ionization, and 15% in total energy influx at 55° geomagnetic latitude. Compared with the great intensity of the magnetic and auroral phenomena in this storm, the cosmic-ray modulation was not exceptionally large. (auth)

15564

BALLOON OBSERVATION OF SOLAR COSMIC RAYS ON MARCH 26, 1958. P. S. Freier, E. P. Ney, and J. R. Winckler (Univ. of Minnesota, Minneapolis). J. Geophys. Research 64, 685-8(1959) June.

The climax of a sequence of solar and terrestrial events in March 1958 was the arrival at the earth of low-energy cosmic rays. The phenomena described were probably initiated by a powerful solar flare. This flare produced two or three of the largest and longest storms ever recorded. The arrival at the earth of this solar cloud was shortly followed by a pronounced decrease in sea level cosmic rays. Instrumented balloon flights were carried out on March 21, March 26, and April 8. The results of these high-altitude measurements are graphically shown. (A.C.)

15565

SCATTERING OF PROTONS BY Ne^{20} AND Ne^{22}. Yukiyasu Oda, Minoru Takeda, Chuin Hu, and Shohei Kato (Osaka Univ.). J. Phys. Soc. Japan 14, 396-402 (1959) Apr.

The angular distributions of protons scattered elastically and inelastically by Ne^{20} and Ne^{22} were observed at six energies from 4.95 to 5.50 Mev. The shape of angular distribution of inelastically scattered protons varies rapidly with incident energy in both cases of Ne^{20} and Ne^{22}. An anomaly is found at 5.25 Mev in the reaction Ne^{20}(p, p$'$)Ne^{20} (Q = −1.63 Mev). The elastic scatterings also exhibit the corresponding features. These results suggest that the reaction proceeds mainly through the compound nucleus formation process. The spin and parity of the compound state seem likely to be 5/2(+). (auth)

15566

SCATTERING OF μ-MESONS WITH MOMENTA OF ABOUT 100 Mev/c IN COPPER AND IRON. V. G. Kirillov-Ugryumov, B. A. Dolgoshein, A. M. Moskvichov, and L. P. Morozova (Moscow Engineering-Physical Inst., U.S.S.R.). Nuclear Phys. 11, 357-67(1959) May (3).

Scattering of μ mesons was studied in 4mm copper plates (μ-meson momenta between 85 and 144 Mev/c) and iron plates (μ-meson momenta between 81.2 and 135 Mev/c). The μ-meson distribution derived from 2350 scattering events satisfactorily agrees with the distribution for a point nucleus. (auth)

15567

DEPOLARIZATION OF μ^--MESONS IN μ-MESIC ATOM FORMATION. I. M. Shmushkevich (Physico-Technical Inst. of the U.S.S.R., Academy of Sciences, Leningrad). Nuclear Phys. 11, 419-31(1959) May (3).

For not very highly excited states the level width in μ-mesic atoms is considerably smaller than the distance between fine structure levels. Spin-orbit interaction should therefore lead to considerable depolarization of μ^- mesons involved in the formation of μ-mesic atoms. The magnitude of this effect is estimated. The influence of hyperfine splitting of the μ-mesic atom ground state on the angular distribution of neutrons created in the capture of μ^- mesons by nuclei is also considered. (auth)

15568

MESONIC "EXCHANGE" EFFECTS IN BETA-DECAY. R. J. Blin-Stoyle and V. Gupta (Clarendon Lab., Oxford) and H. Primakoff (Washington Univ., St. Louis). Nuclear Phys. 11, 444-53(1959) May (3).

An estimate is made, using no-recoil meson theory, of the π-mesonic exchange contributions to the beta-decay of nuclei assuming that such effects only contribute to the axial vector part of the beta-decay interaction. A few percent enhancement in the matrix element for the H^3 → He^3 decay is obtained which is sufficient to account for the discrepancy between the decays of H^3 and n. A similar effect is found for heavier nuclei. (auth)

15569

THE NUMBER OF ELASTIC COLLISIONS IN A FINITE LETHARGY INTERVAL. Wendell C. DeMarcus (Univ. of Kentucky, Lexington). Nuclear Sci. and Eng. 5, 336-7(1959) May.

An integral equation is derived for the function giving the average number of collisions required to thermalize neutrons by elastic collisions with nuclei of relative mass M. An asymptotic solution is obtained which corrects the customary result by between $\frac{2}{3}$ and 1 collision (depending on M). Numerical results for small lethargy increments are presented for the cases M = 2 and M = 235. (auth)

15570

RESONANCE CAPTURE OF NEUTRONS IN HETEROGENEOUS SYSTEMS. Gerd Blässer (Kernreaktor Bau- und Betriebs-G.m.b.H., Karlsruhe, Ger.). Nukleonik 1, 216-21(1959) June. (In German)

An integral equation for the volume-integrated collision density in a heterogeneous infinite expanding medium was derived. It permits the theory of resonance absorption in heterogeneous media to be reduced to the corresponding theory in homogeneous media. It was possible, therefore, to confirm theoretically the expression derived earlier ad hoc for the resonance escape probability. (tr-auth)

15571

ON THE AVERAGE AND THE FLUCTUATION OF SLOWING DOWN TIME OF NEUTRONS IN HEAVY MODERATORS. G. Kosály and G. Németh (Central Research Inst. for Physics, Budapest). Nukleonik 1, 225-7(1959) June.

The average and the mean square deviation of slowing down time of neutrons are derived for heavy moderators. The results are compared with the results obtained by the Fermi and the Greuling-Goertzel approximations. (auth)

15572

DIRECT DECAY $\pi^0 \rightarrow e^+ + e^-$. S. D. Drell (CERN, Geneva and Stanford Univ., Calif.). Nuovo cimento (10) 11, 693-7(1959) Mar. 1.

The direct decay $\pi^0 \rightarrow e^+ + e^-$ is discussed and analyzed as a probe of "pion size." (auth)

15573

THE ELECTRIC DIPOLE MOMENT OF ELEMENTARY PARTICLES. R. L. Garwin (Columbia Univ., New York) and L. M. Lederman (CERN, Geneva). Nuovo cimento (10) 11, 776-80(1959) Mar. 16.

The detection of electric dipole moments (EDM) of elementary particles is discussed and a new limit to the size of the electron EDM is presented ($\lesssim e \cdot 1.5 \cdot 10^{-15}$ cm). This result is used in a discussion of recent observations of positronium annihilation. (auth)

15574

ON THE RADIATIVE DECAY OF CHARGED π-MESONS. N. Cabibbo (Università, Rome and Istituto Nazionale di Fisica Nucleare, Rome). Nuovo cimento (10) 11, 837-42(1959) Mar. 16.

The radiative decay $\pi^+ \to \mu^+ + \nu + \gamma$ is examined in the frame of the A−V theory of weak interactions. The modifications of the spectrum of μ^+ emitted due to the structure of the μ-meson are in part related to the process $\pi^0 \to \gamma + \gamma$. These modifications turn out to be negligible. (auth)

15575

THE $\Sigma \to p + \gamma$ DECAY INDUCED BY HEAVY VECTOR MESONS. P. Prakash (Centro Brasileiro di Pesquísas Físicas, Rio de Janeiro) and A. H. Zimerman (Instituto de Física Teórica, São Paulo, Brazil). Nuovo cimento (10) 11, 869-71(1959) Mar. 16.

The branching ratios for the decay $\Sigma^+ \to p + \gamma$ which is possible through the intermediate vector meson were calculated. The Σ^+ decays virtually into a charged vector meson and a neutral baryon which then recombines to create a proton. The photon may be emitted due to the interaction of the electromagnetic field with the charged meson or with the ingoing or the outgoing charged particles. For the branching ratios, $P(\Sigma \to p + \gamma)$ theo./$P(\Sigma \to p + \pi^0)$ exp. and $P(\Sigma \to p + \gamma)$ theo./$P(\Sigma \to n + \mu^+ + \nu)$ theo., values of 1.4×10^{-4} and 4.3×10^{-3} were obtained. (W.D.M.)

15576

ON THE POSSIBILITY OF NEUTRONS PRODUCING SECONDARY INTERACTIONS IN HIGH ENERGY SHOWERS. P. K. Aditya (Panjab Univ., Chandigarh, India and Univ. of Copenhagen). Nuovo cimento (10) 11, 872-5(1959) Mar. 16.

The processes by which high-energy neutrons of the primary projectile enter the forward cone are considered. The effects on the ratio of the number of secondary interactions produced by neutral particles and the number of interactions produced by charged particles are discussed. (W.D.M.)

15577

THE ATTRACTIVE K^--MESON PROTON INTERACTION. E. M. Ferreira (Imperial Coll., London). Nuovo cimento (10) 11, 880-1(1959) Mar. 16.

It is known that the lowest (2nd) order perturbation theory matrix element $K^- + p \to Y \to K^- + p$, where Y represents Λ or Σ hyperons, has a sign that corresponds to a repulsive potential between K^- and proton for either parity of Λ and Σ hyperons. The question then arises whether or not the higher order matrix elements give contributions of the correct sign and large enough to make agreement with experiment possible. A higher order diagram is calculated that is obtained from the lowest order one by adding the exchange of a π-meson between the incident and the outgoing proton. The case of forward and threshold scattering is considered. (W.D.M.)

15578

A NUCLEONIC CASCADE THEORY AND AN ANALYSIS OF EXTENSIVE AIR SHOWERS. Hiroshi Fukuda (Tokyo Inst. of Tech.); Naofumi Ogita (Kinki Univ., Osaka); and Akira Ueda (Kyoto Univ.). Progr. Theoret. Phys. (Kyoto) 21, 29-73(1959) Jan.

A model of extremely high-energy nuclear collisions which describes Landau's model approximately or satisfies the constancy of transverse momenta of secondary particles as special cases is applied to the nucleonic cascade process in the atmosphere. The model contains some free parameters which specify the dynamical character of the nuclear collisions. The fact that the diffusion equation is solved analytically in a rather simple form on certain assumptions makes it easy to find the best values of the parameters by comparing with experimental information if available. Applications to extensive air showers are presented. The main results obtained are as follows: (i) If the energy spectrum of secondary charged pions at a high-energy collision is well approximated by a power law spectrum $E^{-n}\,dE$, $2 \gtrsim n \gtrsim 1.5$ is consistent with the lateral distribution of high-energy muons far underground. (ii) Any model in which the energy spectrum, the inelasticity, the ratio of charged-to neutral pions are independent of an incident energy in a wide range of $10^{12} \sim 10^{17}$ ev seems unable to explain the altitude variation of the electron component. (iii) The lateral distribution of the electron component is insensitive to the energy spectrum of neutral pions at high-energy collisions and also to the primary energy. Further discussions on the model and the solution of the diffusion equation are given. (auth)

15579

RADIATIVE K-μ DECAY AND QUANTUM ELECTRODYNAMICS AT SMALL DISTANCES. Kichiro Hiida (Kyoto Univ.). Progr. Theoret. Phys. (Kyoto) 21, 98-112(1959) Jan.

Radiative K-μ decay is analyzed as a means of obtaining information on the properties of the muon and Q.E.D. at small distances and (or) on the type of the weak Fermi interaction. To express modifications of the properties of the muon and of Q.E.D. at small distances, cut-off factors are used. For example, if Feynman's cut-off factor with cut-off radius $(1/\Lambda) \gtrsim 0.3 \times 10^{-13}$ cm is used, it is shown that the effects of these modifications may be measurable with the present experimental techniques, provided that the values of the axial vector and vector coupling constants are greater than or equal to that of the tensor coupling constant: $|C_A| \approx |C_V| \geq |C_T|$. If $|C_T| > |C_A| \approx |C_V|$ and $(1/\Lambda) < 0.3 \times 10^{-13}$ cm, on the contrary, the effects of the tensor interaction are measurable. When $(1/\Lambda) \gtrsim 0.3 \times 10^{-13}$ cm and $|C_T| > |C_A| \approx |C_V|$, it is hard to distinguish these two effects. (auth)

15580

ON THE VALIDITY OF DISPERSION RELATIONS IN PERTURBATION THEORY. Noboru Nakanishi (Kyoto Univ.). Progr. Theoret. Phys. (Kyoto) 21, 135-50(1959) Jan.

The dispersion relations with the ordinary threshold energies are proved in every order of perturbation expansion for $\pi-\pi$, $\pi-K$, $\pi-N$, $\pi-\Lambda$, $\pi-\Xi$, K−K, N−N, $\Lambda-\Lambda$, $N-\Xi$, K−N, $K-\Lambda$ forward scatterings. A counterexample is presented for $N-\Lambda$, $N-\Sigma$, $\Sigma-\Sigma$, $\Lambda-\Xi$, $\Sigma-\Xi$ scatterings. Non-forward scattering also are treated. (auth)

15581

LOW ENERGY KAON-NUCLEON REACTIONS. Akira Komatsuzawa and Reiji Sugano (Kyoto Univ.) and Yukihisa Nogami (Univ. of Osaka Prefecture, Sakai, Japan). Progr. Theoret. Phys. (Kyoto) 21, 151-73(1959) Jan.

The low energy KN and $\overline{K}N$ reactions are investigated in the case in which the kaon-nucleon-hyperon interaction is of the scalar type, with the nonrelativistic approximation. Direct interactions between kaons and pions are not considered. The higher order effects of kaons and pions are examined in detail and their importance is emphasized. It is shown that, as far as the parameters are adjusted to fit the experimental data on the KN scattering, those of the $\overline{K}N$ scattering can be hardly reproduced. (auth)

15582

COLLECTIVE MOTION AND PARTICLE EXCITATION IN MANY FERMION SYSTEM. Shuji Takagi (Osaka Univ.). Progr. Theoret. Phys. (Kyoto) 21, 174-84(1959) Jan.

A relation between collective motion and particle excitation in many fermion system is investigated. A method to construct collective coordinates is presented. Preliminary application to nuclear structure is done. Relations to other theory of collective motion are briefly discussed. (auth)

15583

A POSSIBLE SYMMETRY IN SAKATA'S COMPOSITE MODEL. S. Ogawa (Hiroshima Univ.). Progr. Theoret. Phys. (Kyoto) 21, 209-11(1959) Jan.

In Sakata's model of strongly interacting particles, it is assumed that the proton, neutron, and Λ-particles are the basic particles which combine in various manners to make up mesons and other baryons. A certain quality which exists among these three particles is investigated. The view is taken that there exists a certain origin of the mass of the particle which can never be reduced to the self-action of the usual interactions. The symmetry of the interaction among the three basic particles is of primary importance and charge independence has a secondary meaning. (A.C.)

15584

A NOTE ON THE PHYSICAL STATE OF UNSTABLE PARTICLES. N. Nakanishi (Kyoto Univ.). Progr. Theoret. Phys. (Kyoto) 21, 216-17(1959) Jan.

The physical state of the unstable V-particle is investigated. The decay amplitude and the renormalization factor are calculated. (A.C.)

15585

INITIAL ENERGY DISTRIBUTION AND ANGULAR DISTRIBUTION OF PHOTOELECTRONS. Wu Chuan-teh (Peking Univ.). Wu Li Hsüeh Pao 14, 139-52(1958). (In Chinese)

Nottingham's empirical formula for the transmission coefficient is used to develop the DuBridge theory of initial energy distribution of photoelectrons from metal. Owing to the detailed considerations of refraction for an electron passing through the potential barrier of the surface, not only are the energy distribution and the normal energy distribution of photoelectrons discussed, but also the angular distribution. All discussions are assumptions that the surface is ideal, the energy distribution of electrons in the metal is according to the Fermi-Dirac distribution, and the intensity of incident monochromatic light is constant and unpolarized. The obtained formula of initial energy distribution of photoelectrons is very simple, but is more satisfactory than other theories. The curve of angular distribution of photoelectrons is like an egg with its large end outward. If there is no refraction effect, the angular distribution satisfies Lambert's law. The spectral distribution, the theoretical formula of volt-ampere characteristic under the retarding field of a spherical condenser with a small photocathode as one electrode at center, the normal energy distribution, and the theoretical volt-ampere characteristic of ideal parallel plate condenser are also discussed. (auth)

15586

ON THE SLOWING DOWN OF NEUTRONS IN TWO ADJACENT MEDIA. Huang Tsu-chia. Wu Li Hsüeh Pao 14, 156-62(1958). (In Chinese)

The slowing-down densities of neutrons in two adjacent media of different slowing-down properties were calculated according to the age theory. The outer medium is extended to infinity. The inner medium consists of a sphere of radius α, and contains a monoenergetic fast neutron-source in the form of a concentric spherical shell of radius R. The method of Laplace transformation is used in solving the problem. The results are given by expansions which converge rapidly for those cases usually met. For a case where the two media are heavy water and graphite, and the fast neutron-source is of energy 2 Mev, numerical results for the slowing-down densities at thermal energy are obtained and compared with those obtained by the usual two-group approximation. (auth)

15587

ELASTIC SCATTERING OF HIGH ENERGY ELECTRONS WITH NUCLEI C^{12}. King Sing-nan. Wu Li Hsüeh Pao 15, 25-31(1959). (In Chinese)

The elastic scattering of high energy electrons by C^{12} were calculated. The charge distribution of the C^{12} nucleus is taken as follows: exponential distribution, $\rho(x) = \rho_0 e^{-(x)/(a)}$; gaussian distribution, $\rho(x) = \rho_0 e^{-(x^2)/(b^2)}$; uniform distribution, $\rho(x) = \rho_0$ when $0 < x < kR$ and 0 when $x > kR$, where a and b are the parameters, and the constant R is the radius of the nucleus C^{12}. The energy of the electrons is 187 Mev. The result of the calculation shows that the gaussian distribution confirms the experimental result better than the other two kinds of distributions, and gives $R = (12)^{1/3} r_0$, where $r_0 = 1.35 \times 10^{-13}$ cm. (auth)

15588

THE BRANCHING RATIO OF THE DECAY OF THE K^+-MESON. Lee Wen-tzu, San Ding-chang, Ho Tsu-hsiu, and Tzu Hung-yuăn. Wu Li Hsüeh Pao 15, 32-41(1959). (In Chinese)

The branching ratios of the three modes of K^+ decay, $\mu^+ + \pi^0 + \nu$, $e^+ + \pi^0 + \nu$, and $\mu^+ + \nu$, were calculated by using the theory of the universal Fermi weak interaction proposed by Feymann and others. The perturbation method with cut-off is used. The ratio obtained is 1 : 1.5 : 12, which is in fair agreement with the experimental value 1 : 1 : 15. It is shown that other combinations of Fermi interactions can not give result in agreement with experiment. (auth)

15589

ON THE BRANCHING RATIOS OF THE DECAYS OF THE HYPERONS AND THE RATIOS OF THE MEAN LIFE TIMES. J. M. Chen, T. H. Ho, D. C. San, and H. Y. Tzu. Wu Li Hsüeh Pao 15, 63-76(1959). (In Chinese)

The branching ratios of the decay of the hyperons, the ratios of the mean lifetimes of the various hyperons, and the ratios of the lifetimes of hyperons to K^+-mesons are calculated by using the universal Fermi weak interaction proposed by Feynman and Gell-Mann and the strong interaction proposed by Salam. The perturbation theory is used with a cut off in the region of large momentum. By using the coupling constants of the strong interaction given by Warner and choosing suitable values for the other two coupling constants remaining to be fixed, most of the calculated results agree fairly well with experiments. The worst result differs from the experimental values at most by a factor of 2. The theoretical values of the branching ratios of K^+-decay derived from this set of coupling constants show better agreement with experiment than previous results. Calculations show that the universal Fermi weak interaction of V-A type gives a satisfactory explanation of the decay phenomena of K-mesons and hyperons. It is also evident from the calculation that these decays must be regarded as phenomena brought about by the joint action of strong and weak interactions and that there exist two classes of strong interactions: the "very strong" and the "medium strong." The results favor the assumption that the Λ and Σ have the same parity. They also show that of the 4 terms of the strong interaction Hamiltonian given by Salam involving the K-meson, at least two terms involve a γ_5 matrix. (auth)

15590

ANGULAR DISTRIBUTION OF THE DECAY PRODUCTS OF HYPERONS. J. M. Chen, T. H. Ho, D. C. San, and H. Y. Tzu. Wu Li Hsüeh Pao 15, 77-88(1959). (In Chinese)

By assuming various forms of interaction Hamiltonian, the angular distribution of the decay products of spin $^1/_2$ particle obeying the Dirac equation and that of spin $^3/_2$ particle obeying the Rarita-Schwinger equation are calculated. The ratio of the strength of parity conserving and parity non-conserving interactions on the one hand and the asymmetry parameter α on the other hand is discussed. It is pointed out, that if the vector and pseudo-vector coupling in the universal Fermi weak interaction proposed by Feynman and Gell-Mann are exactly equal to each other, then this theory gives an asymmetry parameter α of Λ particle decay, which is consistent with experimental results. If the ratio of the square of these two coupling constants is $1:1.55$ as suggested by β-decay experiments, then the derived asymmetry parameter is -0.97, which is on the margin of the experimental data. The angular distribution of the decay products of spin $^3/_2$ particle obeying the Rarita-Schwinger wave equation cannot be made to agree with the experimental result of the Λ particle decay, a conclusion which was first pointed out by Lee and Yang by using general arguments. (auth)

Heat Transfer and Fluid Flow

15591 AD-151340

Stanford Univ., Calif.

THE INFLUENCE OF NON-UNIFORM HEAT FLUX ON THE CONVECTION CONDUCTANCES IN A NUCLEAR REACTOR. Technical Report No. 33. W. M. Kays and W. B. Nicoll. Nov. 1, 1957. 49p. Contract Nonr-225 (23).

In a typical internally cooled nuclear reactor the heat flux varies markedly along the length of the coolant flow tubes. In this report an investigation is made of the effect of varying heat flux on the convection conductances along the coolant flow tubes and on the tube surface temperatures. Variations such as a cosine heat flux and a heat flux patch applied in the vicinity of the maximum heat flux are considered. Two coolants are considered, a liquid metal with the results characteristic of low Prandtl number coolants and high-pressure helium with the results characteristic of gas and pressurized water coolants. It is found that the effects of non-uniform heat flux can have a fairly substantial effect with a liquid metal coolant, although it is still possible to predict the maximum surface temperature and the location of the maximum temperature point, within what is probably the uncertainty of the low Prandtl number convection data, using simple constant heat flux theory. For gases and higher Prandtl number fluids the effects are quite negligible and the tube wall temperatures can be accurately predicted with constant heat flux theory. In all examples the fluid is in turbulent flow and the flow is through circular tubes, but the conclusions should be equally applicable to noncircular tubes. (auth)

15592 AD-201679

Michigan. Univ., Ann Arbor.

A COMPARISON OF THE HEAT TRANSPORT EFFECTIVENESS OF SOME COOLANTS AND HOMOGENEOUS FUELS USED IN THE PRIMARY LOOP OF NUCLEAR POWERPLANTS. (thesis). William L. Shields, Jr. Aug. 1958. 69p.

A comparison of the heat transport effectiveness of some coolants and homogeneous fuels used in a nuclear power plant primary loop is made. A survey of the general problem of coolant comparison is presented as well as discussion of the state of coolant technology. Equations to represent the heat transport effectiveness of various coolants and homogeneous fuels are also presented along with an evaluation of heat transport effectiveness using these equations and a discussion of some applications to design. (J.R.D.)

15593 DOFL-TM-59-4

Diamond Ordnance Fuze Labs., Washington, D. C.

THE THERMAL CONDUCTIVITY OF SOLIDS AT HIGH TEMPERATURES—A BIBLIOGRAPHY. W. T. K. Johnson. June 1, 1959. 77p.

A bibliography on the thermal conductivity of solids is presented, with emphasis on measurement techniques at high temperatures. The references are presented in two groups; those published between 1940 and early 1958, and those published prior to 1940. A total of 474 references is given. Most of the references since 1940 are accompanied by a brief description of content. This information has been compiled in connection with studies on thermoelectric generators. (auth)

15594 NASA-M-2-5-59W

Convair, San Diego, Calif.

HEAT TRANSFER IN A LIQUID METAL FLOWING TURBULENTLY THROUGH A CHANNEL WITH A STEP FUNCTION BOUNDARY TEMPERATURE. H. F. Poppendiek. Mar. 1959. 55p.

Originally prepared as Report ZPh-015.

An analytical heat-transfer solution is derived and evaluated for the general case of a turbulently flowing liquid metal which suddenly encounters a step-function boundary temperature in a channel system. Local Nusselt moduli, dimensionless mixed-mean fluid temperatures, and arithmetic-mean Nusselt moduli are given as functions of Reynolds and Prandtl moduli and a dimensionless axial-distance modulus. These solutions are compared with known solutions of more specific systems as well as with a set of experimental liquid-metal heat-transfer data for a thermal entrance region. (auth)

15595 OOR-1534.1

Johns Hopkins Univ., Baltimore. Inst. for Cooperative Research.

AN INVESTIGATION OF THE VISCOUS AND INERTIAL COEFFICIENTS FOR THE FLOW OF GASES THROUGH POROUS SINTERED METALS WITH HIGH PRESSURE GRADIENTS. Interim Technical Report No. 1. Eric Weger and D. B. Greenberg. Mar. 1959. 77p. DA Project No. 5B99-01-004. Contracts DA-36-034-ORD-2353 and DA-35-034-509-ORD-3RD. (AD-213897).

The steady-state flow of gas through porous sintered metals under high pressure gradients was investigated. The behavior of the viscous and inertial flow coefficients in such media was determined as a function of pressure and temperature. The mean cross-section diameters which were derived from the pore size distributions of various cores correlated well with experimentally obtained permeabilities. Results show that permeability decreases significantly as the temperature of a sintered porous medium is increased. The inertial coefficient was found to be constant within the pressure and temperature ranges which were covered by the present experiments. (auth)

15596 WADC-TR-58-186
Illinois Inst. of Tech., Chicago.
HEAT AND MASS TRANSFER BIBLIOGRAPHY WITH SELECTED ABSTRACTS. W. J. Christian and T. H. Schiffman. Apr. 1954. 172p. Project No. 61133. Contract AF18(600)-153. (AD-151199).

A literature survey is presented on the local average mass transfer from surfaces under isothermal and non-isothermal conditions, local and average heat transfer from pertinent airfoil surfaces, and correlations between heat and mass transfer. (J.E.D.)

15597 AERE-Lib/Trans-816
INVESTIGATION OF THE RESISTANCE DURING THE MOVEMENT OF STEAM—WATER MIXTURES IN A HEATED BOILER PIPE AT HIGH PRESSURES. A. A. Armand and G. G. Treshchev. Translated by J. B. Sykes (U.K.A.E.A., Atomic Energy Research Establishment) from Izvest. Vsesoyuz. Teplotekh. Inst. im. Feliksa Dzerzhinskogo 16, 1-5(1947). 15p.

The results of an experimental investigation of resistance to motion in a horizontal pipe of a two phase air-water mixture are given. On the basis of the investigation, formulas for calculating the resistance, covering pressures from 10 to 180 atmospheres, were derived. (J.E.D.)

15598
PRECISE MEASUREMENT OF PROCESS TEMPERATURE DIFFERENCES. Bruce G. Kitchen (E. I. duPont deNemours and Co., Inc., Aiken, S. C.). ISA Journal 6, No. 2, 39-42(1959) Feb.

The reactor coolant heat-rise was determined by the differential-temperature measuring circuit of a power calculator which computed and recorded reactor power. (W.L.H.)

15599
TURBULENT LIQUID-METAL HEAT TRANSFER IN CHANNELS. H. F. Poppendiek (Convair, San Diego, Calif.). Nuclear Sci. and Eng. 5, 390-404(1959) June.

An analytical heat transfer solution is derived and evaluated for the general case of a turbulently flowing liquid metal which suddenly encounters a step-function boundary temperature in a channel system. Local Nusselt moduli, dimensionless mixed-mean fluid temperatures, and arithmetic-mean Nusselt moduli are given as functions of Reynolds and Prandtl moduli and a dimensionless axial-distance modulus. These solutions are compared with known solutions of more specific systems as well as with a set of experimental liquid-metal heat transfer data for a thermal entrance region. The results of this study can be used to define the temperature structure and heat transfer in solid-fuel element reactor cores and accelerator targets that are being cooled by liquid metals. (auth)

Nuclear Properties and Reactions

15600 AD-201562
Ohio State Univ., Columbus.
CLOUD CHAMBER, GAMMA-GAMMA, AND BETA SPECTRUM STUDIES OF COBALT-56 (thesis). John William Talley. 1958. 73p.

An investigation was conducted to clarify the modes of positron decay and the gamma-ray de-excitation of cobalt-56 in certain areas. Two samples were used, consisting of proton activated spectroscopically pure iron and enriched iron-56. Both targets were chemically treated to obtain carrier-free samples of cobalt. Beta spectrum data were obtained with a Wilson cloud chamber and a solenoidal spectrometer. Gamma-ray and gamma-gamma coincidence data were obtained with two gamma scintillation spectrometers with a coincidence unit having a resolving time of 9.75×10^{-8} seconds. From the beta spectra data three positron groups were found. The 1.49 and 0.21 Mev groups were assigned to the decay of cobalt-56. The 0.45 Mev group was assigned to the decay of cobalt-58 because of varying intensities in different samples. From the gamma-gamma coincidence data, two gamma-rays with energies of 1.30 and 1.34 Mev were determined to be in coincidence with the 0.845 Mev gamma-ray. The 1.75 Mev region was found to consist of two gamma-rays of 1.74 and 1.77 Mev. These were in coincidence with both the 0.845 and 1.24 Mev gamma-rays. The 2.60 Mev region was found to consist of two gamma-rays of 2.54 and 2.60 Mev in coincidence with the 0.845 Mev gamma-ray. A 2.69 Mev peak was associated with the pair production process of the 3.20 Mev gamma-ray. Additionally, a 2.66 Mev gamma-ray was determined to go to the ground level of iron-56. By utilizing the information obtained during this investigation, the best available information pertaining to the energy levels of iron-56, and previous results, a decay scheme was proposed. (auth)

15601 AD-208136
Ohio State Univ., Columbus.
GAMMA RAYS EMITTED BY ARSENIC 76 AND THEIR COINCIDENCES. (thesis). Ronald D. Kane. 1958. 94p.

The gamma rays of arsenic-76 were investigated by means of a gamma scintillation spectrometer and gamma-gamma coincidence techniques. This study was prompted as a result of Cartwright's magnetic beta-gamma coincidence studies of the beta spectrum of arsenic-76 which showed that a fourth inner beta group of about 1.18 Mev existed. Although Hubert had previously reported the existence of this fourth inner beta group and the corresponding 1.78 Mev energy level of selenium-76, it was not found by Krauschaar and Goldhaber. All these investigations reported gamma rays of about 0.55, 0.65, 1.20, 1.40, and 2.05 Mev and gamma coincidences between the 0.55-0.65, 0.55-1.40, and 0.55-2.05 Mev gamma rays. The 0.55, 0.65, 1.40, and 2.05 Mev gamma rays were confirmed. (A.C.)

15602 AE-17
Aktiebolaget Atomenergi, Stockholm.
RADIOACTIVE NUCLIDES FORMED BY IRRADIATION OF THE NATURAL ELEMENTS WITH THERMAL NEUTRONS. Kim Ekberg. Feb. 1959. 31p.

The radioactive nuclides formed by the irradiation of the natural elements with thermal neutrons are listed with their half life and tenth life, β energy or type of decay, and energy and abundance of gamma decay. The 2200 m/sec neutron absorption cross sections and the saturation activity per gram for a certain flux are given for the natural elements. (W.D.M.)

15603 AECU-4169
Harvard Univ., Cambridge, Mass. Lyman Lab. of Physics.
NUCLEAR SPECTRA OF THE THORIUM ACTIVE DEPOSIT. Technical Report No. 1-9. Guy Trask Emery. Nov. 22, 1958. 94p. Sponsored by ONR and AEC under Contract Nonr-1866(19). $15.30(ph), $5.40(mf) OTS.

The relative intensities of the gamma rays of the descendants of radiothorium were studied by measuring the photoelectron spectrum from thorium and platinum foils. The relative sensitivity of the arrangement at different energies was found by using other sources having gamma rays of known relative intensity. Some of the previous work on the radiations from the thorium active deposit is reviewed. Comparison of the measured gamma-ray intensities with the measurements by others of internal conversion intensities allowed internal conversion coefficients to be computed and the multipolarities of many transitions to be determined. An electric monopole transition was found in polonium-212. The gamma intensities were used to find the intensities of beta branches and the nature of the beta transitions. Gamma intensities were compared with the known intensities of long range alpha particles from polonium-212 and some gamma half lives were computed for that nucleus. The level schemes of polonium-212, lead-208, thallium-208, and bismuth-212 are discussed in the light of the information found here and other recent information, and are compared with the predictions of the shell and collective models. A listing of much of the previous work on the radiations from and decay schemes of these nuclei is included. (auth)

15604 AECU-4170
Harvard Univ., Cambridge, Mass. Lyman Lab. of Physics.
PHOTOELECTRIC AND INTERNAL CONVERSION SPECTRA OF NEUTRON-DEFICIENT IRIDIUM ISOTOPES (thesis). Technical Report No. 3-9. Walter Reilly Kane. Jan. 23, 1959. 139p. Sponsored by AEC and ONR under Contract Nonr-1866(19). $21.30(ph), $6.90(mf) OTS.

The photoelectric and internal conversion spectra of the neutron-deficient isotopes Ir^{188}, Ir^{189}, and Ir^{190} were investigated with the aid of a double-focusing spectrometer. The energies and intensities of a large number of electromagnetic transitions are reported. Transition energies were determined precisely by a direct comparison of internal conversion lines with the lines of the the thorium active deposit and with Auger lines, and by a critical absorption experiment. In order to obtain relative gamma ray intensities from the photoelectric conversion data the spectral response of the arrangement for the photoelectric conversion of gamma radiation was first determined using sources of Na^{24}, Na^{22}, and Hf^{180m}, each of which emits gamma rays of several energies with well established intensity ratios. Internal conversion coefficients are given for a number of transitions. These, coupled with internal conversion K/L and L subshell intensity ratios permit the assignment of multipole orders in a number of cases. The level schemes of Os^{188}, Os^{189}, and Os^{190} are discussed in terms of the present results and other recent information. A comparison is made with theories of collective nuclear excitations. (auth)

15605 AECU-4182
Michigan. Univ., Ann Arbor. Harrison M. Randall Lab. of Physics.
DECAY OF Eu^{152m}. R. E. Sund, R. G. Arns, and M. L. Wiedenbeck. [1959]. 15p. $3.30(ph), $2.40(mf) OTS.

Presented at the 1959 Spring Meeting of the Am. Phys. Soc.

The gamma rays in Sm^{152} and Gd^{152} following the decay of the 9.3 hour metastable state of Eu^{152} were studied in permanent magnet spectrographs. A number of new weak transitions were observed, and a decay scheme is proposed. Directional correlation measurements were made on two cascades in Sm^{152} and on one cascade in Gd^{152}. The measurements confirm the spin and parity assignments of 1- and 2+ for the 0.963 Mev and 0.122 Mev levels in Sm^{152}. Possible spin assignments for the 1.511 Mev level in Sm^{152} are discussed. The 1.315 Mev and 0.344 Mev levels in Gd^{152} have a spin and parity of 1- and 2+, respectively. Multipolarities are given for the principal gamma transitions. (auth)

15606 NP-7610
Michigan. Univ., Ann Arbor. Harrison M. Randall Lab. of Physics.
THE LEVEL STRUCTURE OF Dy^{160}. R. G. Arns, R. E. Sund, and M. L. Wiedenbeck. [1959]. 17p.

Gamma rays in Dy^{160} following beta decay of the 72 day Tb^{160} were studied using coincidence and angular correlation methods. The relative intensity and coincidence measurements confirm the principal features of the decay scheme proposed by Nathan. Angular correlation measurements were made on six cascades. The spin and parity of the 0.087 Mev, 0.964 Mev, and 1.262 Mev levels were found to be 2+, 2+, and 2−, respectively. The measurements favor spins of 4 and 3 for the 0.283 and 1.359 Mev levels. These assignments are in agreement with previous assignments by Ofer. The multipolarities of the main gamma transitions are given. (auth)

15607 NP-7614
Joint Inst. for Nuclear Research, Dubna, U.S.S.R. Lab. of Theoretical Physics.
THE SIMULATING OF P-P INTERACTION AT 10 BEV. G. I. Kopylov. 1959. 31p.

Simplified methods of numerical simulating the reactions involving 5−6 secondary particles is described, the isobar model is being taken into account. The table of random stars for p-p interaction at 10 Bev containing 201 stars in the center of mass system and in the laboratory system is given. (auth)

15608 NP-7638
Pennsylvania. Univ., Philadelphia.
GAMMA-RAY ACTIVATION OF CARBON. Technical Report No. 5. Leonard D. Cohen. 1957. 88p. Contract Nonr-551-(17).

Carbon samples were activated by the monochromatic gamma-rays produced by the reaction $T(p,\gamma)He^4$. The gamma-ray energy was varied over the range 20.1 to 21.1 Mev by varying the energy of the protons produced by a Van de Graaff accelerator. The resolution (80 kev) and sensitivity (0.4 mb) were sufficient to detect structure in the $C^{12}(\gamma,n)C^{11}$ reaction. The results show that structure in the reaction $C^{12}(\gamma,n)C^{11}$ does not exist to the extent predicted by L. Katz and co-workers. The results are not inconsistent with broader structure reported from the $C^{12}(\gamma,p)B^{11}$, $B^{11}(p,\gamma)C^{12}$, and $B^{11}(p,n)C^{11}$

reactions. A reaction cross-section versus photon energy curve is given. (auth)

15609 NP-7647
Polish Academy of Sciences. Inst. of Nuclear Research, Warsaw.
FIRST FORBIDDEN BETA TRANSITIONS FOR THE UNIVERSAL FERMI INTERACTION. Report No. 76/VII. B. Kuchowicz. Mar. 1959. 20p.

Formulas are presented for the electron polarization in recoil experiments for the case of first forbidden beta transitions. The formulas were derived by means of the Cutkosky-Deloff trace technique. All Coulomb effects (for a point nucleus) are included. In accordance with the present knowledge of β-decay the vector and axial vector parts of the universal Fermi interaction are taken with different coupling constants. For the case of $0 \rightarrow 0$ (yes) transitions the formulas are compared with the formulas given by Berestetsky et al. Some discrepancies are shown to exist in the asymptotic form. An attempt was made to explain this. (auth)

15610 SPM-263
France. Commissariat a l'Energie Atomique, Paris.
EFFETS DES REACTIONS (n, 2n) ET (n,α) DU BERYLLIUM DANS UN REACTEUR A GLUCINE. (Effects of (n, 2n) and (n,α) Reactions of Beryllium in a Reactor with Beryllia.) P. Benoist, P. Esclangon, and K. Sahai. May 20, 1957. 10p.

The abnormally high value of the laplacian of a beryllium oxide—natural uranium lattice can perhaps be caused by secondary neutron reactions in the beryllium oxide. An attempt is made to establish the effect of these reactions in a beryllia reactor. The equations for the neutron balance of the secondary reactions are derived and evaluated. The results are applied to the case of a reactor with a heterogeneous medium. (J.S.R.)

15611 UCRL-5419
California. Univ., Livermore. Lawrence Radiation Lab.
TABLES OF NUCLEAR REACTION Q VALUES. Val J. Ashby and Henry C. Catron. Feb. 10, 1959. 337p. Contract W-7405-eng-48. $5.00(OTS).

Tables of nuclear reaction Q values were calculated from nuclide masses, when possible, for those 42 reactions involving γ, n, p, d, t, He^3, or He^4 as either incident or product particle for about 650 target nuclides. Approximately 8000 Q values are tabulated. (auth)

15612 UCRL-8664
California. Univ., Berkeley. Lawrence Radiation Lab.
NUCLEAR DECAY SCHEME STUDIES OF SOME TANTALUM AND TERBIUM ISOTOPES (thesis). Kenneth T. Faler. Apr. 1959. 84p. Contract W-7405-eng-48. $2.25(OTS).

A previously unreported isotope of terbium, Tb^{152}, was produced. Its gamma-ray spectrum was studied and its half life was determined to be 18.5 ± 0.5 hr. The similarity to the half lives of two neighboring isotopes, 19-hr Tb^{151} and 17-hr Tb^{154}, explains why it was previously overlooked. The decay scheme of Tb^{161} was studied and precise transition energies are reported. The lifetimes of two excited states were measured and used to resolve a question of transition sequence encountered by previous investigators. Three new isotopes of tantalum were discovered. They are 3.7-hr Ta^{173}, 1.2-hr Ta^{174}, and 11-hr Ta^{175}. Tantalum-175 was studied in detail and a decay scheme is presented using eight of the transitions observed in conversion-electron studies. Four excited states are proposed, and Nilsson quantum numbers are assigned. Electron-sensitive nuclear track emulsions were used in conjunction with electron spectrographs, and the usefulness of the method of track counting is discussed. (auth)

15613 UCRL-8678
California. Univ., Berkeley. Lawrence Radiation Lab.
MECHANISMS OF THE (α,pn) REACTION (thesis). Robert Joseph Silva. Mar. 1959. 79p. Contract W-7405-eng-48. $2.00(OTS).

Radiochemically determined excitation functions were measured for the (α,pn) nuclear reactions of Ni^{60}, Ni^{62}, Se^{80}, Pd^{110}, and La^{139} by using helium ions of 20 to 48 Mev. These data, combined with published and unpublished data of other workers, show the general trends in the (α,pn) reaction of elements ranging from Fe^{54} to Cf^{252}. Energy spectra and angular distributions of deuterons and protons, produced in bombardments with helium ions of 40 and 48 Mev, were obtained for Be^9, Al^{27}, Ni^{60}, Pd^{110}, Bi^{209}, and U^{238} by using scattering-chamber methods. Experimental limitations restricted the study to helium-ion bombarding energies greater than 40 Mev, and observed proton and deuteron energies of greater than about 15 Mev. The energy spectra and angular distributions are similar to those characteristic of the optical-model component of nuclear reactions. Total integrated cross sections for the (α,d) and (α,pn) reactions were calculated from the energy spectra and angular distributions of the protons and deuterons. A simple mechanism, involving the prompt emission of a high-energy proton followed by neutron evaporation, was used to calculate the (α,pn) cross sections. Most of the features of the radiochemically determined excitation functions can be explained by emission of high-energy deuterons and protons by direct-interaction processes. The (α,d) and (α,pn) cross sections calculated from the scattering-chamber data can account for nearly all the radiochemically determined (α,pn) cross sections for the elements studied, except Fe^{54}, Ni^{60}, and Ni^{62}. The large cross sections for these nuclides appear to be best explained by compound-nucleus processes. The angular distribution of deuterons and protons from the $Be^9(\alpha,d)B^{11}$ and $Be^9(\alpha,p)B^{12}$ reactions, leading to definite states of B^{11} and B^{12}, can be fitted reasonably well by Butler's theory. (auth)

15614 UCRL-8721
California. Univ., Berkeley. Lawrence Radiation Lab.
SOME NUCLEAR PROPERTIES OF Bi^{206}, Tl^{200}, Tl^{201}, Tl^{202}, In^{109}, In^{110m}, AND In^{111}. The Nuclear Spins of Bi^{206}, Tl^{200}, Tl^{201}, and Tl^{202}. The Nuclear Spins, Magnetic Dipole, and Electric Quadrupole Interaction Constants of In^{109}, In^{110m}, and In^{111}. (thesis). Lawrence Louis Marino. Apr. 6, 1959. 131p. Contract W-7405-eng-48. $2.75(OTS).

The atomic-beam magnetic-resonance flop-in technique using radioactive detection was employed to measure the nuclear spins of Bi^{206}, Tl^{200}, Tl^{201}, Tl^{202}, In^{109}, In^{110m}, and In^{111}. In addition, the magnetic-dipole and electric-quadrupole interaction constants of In^{109}, In^{110m}, and In^{111} were determined. The signs of the In^{110m} constants were not determined. Results, theory, procedure, and data reduction are given. (auth)

15615 AEC-tr-3684
NUCLEAR RESONANCE ABSORPTION OF GAMMA RADIATION IN Ir^{191}. Rudolf L. Mössbauer. Translated for Los Alamos Scientific Lab. from Naturwis-

senschaften 45, 538-9(1958). 3p. \$1.80(ph), \$1.80(mf) JCL.

This paper was previously abstracted from the original language and appears in NSA, Vol. 13, as abstract No. 5036.

15616

SCATTERING OF THE γ RAYS OF Co^{60} AND Zn^{65} IN HEAVY AND INTERMEDIATE ELEMENTS. (STUDY OF THE POLARIZATION EFFECT OF VACUUM IN THE ELASTIC SCATTERING OF γ RAYS.) Eiichi Hara. Ann. phys. 4, 239-85(1959) Mar.-Apr. (In French)

The scattering cross sections of 1.33-Mev gamma rays were measured in tin for angles between 20 and 115° and in uranium and lead at 20°. The ratio of the scattering cross sections for 1.17- and 1.33-Mev radiations from Co^{60} and the scattering cross section of Zn^{65} 1.12-Mev gamma rays were determined. The experimental values are in good agreement with the curves derived from complete calculations for the terms relative to the absorption and reemission of photons by the electron cortege. The bonding of these electrons in the intermediate state was considered. The method and apparatus used for the measurements are described in detail. 78 references. (J.S.R.)

15617

SPECTROSCOPIC DETERMINATION OF THE Lu^{176} NUCLEAR SPIN. N. I. Kaliteevskii and M. P. Chaika (Zhdanov Leningrad State Univ.). Doklady Akad. Nauk S.S.S.R. 126, 57-8(1959) May 1. (In Russian)

The nuclear spin of Lu^{176} was determined in relation to the intensity of the Lu λ6436 line. The measurements were made with a photoelectric spectrometer with the Fabry-Perot interferometer using 2 mg of Lu_2O_3 enriched about 30% with Lu^{176}. In order to avoid errors the hyperfine structure of Lu^{175} was recorded under identical conditions, and the intensity curves of Lu^{175} were subtracted from the corrected curves for Lu^{176}. The resulting curve was used for determining the intensity ratio of Lu^{176} c/a components. Considering the corrections made by superimposing the measured component contours, the ratio $c/a = 1.31 \pm 0.03$. The dependence of the c/a ratio intensity values of the Lu λ6463 A line hyperfine structure components on the Lu^{176} spin I value was 1.444, 1.364, 1.308, and 1.267. The measured intensity $c/a = 1.31 \pm 0.03$ is in good agreement with the spin value I = 7. (R.V.J.)

15618

SEARCH FOR ^{20}O. S. Amiel and R. E. Segel (Brookhaven National Lab., Upton, N. Y.). J. Inorg. & Nuclear Chem. 10, 4-7(1959) Apr.

An attempt was made to observe O^{20} by irradiating O^{18} with tritons produced by the $Li^6(n,\alpha)H^3$ reaction. Copious quantities of F^{20} produced by the $O^{18}(t,n)F^{20}$ reaction were observed, but there were no indications of O^{20} from the $O^{18}(t,p)O^{20}$ reaction. From an analysis of the decay curve and γ-ray spectrum of the irradiated samples, an upper limit of $\tau_{1/2} < 50$ sec for O^{20} is deduced. (auth)

15619

BRANCHING FRACTION AND HALF-LIFE OF POTASSIUM-42. J. Mackin and D. Love (Naval Radiological Defense Lab., San Francisco). J. Inorg. & Nuclear Chem. 10, 17-22(1959) Apr.

Measurements were carried out to determine the branching fraction and half-life of potassium-42. A value of 0.184 ± 0.014 for the number of 1.51 Mev photons/dis was obtained by absolute counting and ionization chamber techniques. The half-life measurements yielded a value of 12.37 ± 0.09 hr. (auth)

15620

MEASUREMENT OF BREMSSTRAHLUNG SPECTRA WITH SODIUM IODIDE SCINTILLATION CRYSTAL. Motoharu Kimura, Naosi Mutsuro, Yuji Ohnuki, Katsufusa Shoda, Masumi Sugawara, Tsutomu Tohei, and Haruo Yuta (Tohoku Univ., [Sendai, Japan]). J. Phys. Soc. Japan 14, 387-96(1959) Apr.

The bremsstrahlung spectra of the 8.5-Mev electrons for the forward direction were measured with a scintillation spectrometer with a sodium iodide crystal 4 in. in diameter and 4 in. in length. Be, Ni, and Pt of several thickness were used as the targets. The measured spectra were compared with our semi-empirical calculation. The calculation was based upon the response function for NaI crystal which was constructed referring to the method developed by NBS group and also to the actual response curve for the monochromatic gammas of 1.12 and 6.14 Mev, instead of using Monte Carlo method which had generally been used in the former researches. The agreement is rather good if Schiff's formula for the intrinsic bremsstrahlung spectra is assumed. (auth)

15621

ON THE LOW LYING LEVELS OF Mn^{55}. II. Sadaaki Yanagawa (Univ. of Tokyo). J. Phys. Soc. Japan 14, 539(1959) Apr.

15622

ELASTIC AND INELASTIC SCATTERING OF 22 Mev ALPHA PARTICLES BY LIGHT ELEMENTS. Chuin Hu, Shohei Kato, Yukiyasu Oda, and Minoru Takeda (Osaka Univ.). J. Phys. Soc. Japan 14, 549-54(1959) May.

The scattering of 22-Mev alpha particles from carbon, magnesium, and silicon was studied with scintillation counter technique. The elastic scatterings from carbon and magnesium show the characteristic diffraction pattern, which can be obtained from the theory of diffraction by an opaque sphere. The observed inelastic angular distributions could be approximated by the squares spherical Bessel function of second order as predicted by direct interaction theory. The agreement is appreciably good for the elements. However, the cross sections do not tend toward small values in the forward direction for magnesium and silicon. (auth)

15623

$Be^9(n,2n)Be^8$ AND $B^{11}(n,\alpha)Li^8(\beta)Be^8$ REACTIONS BY 14 Mev NEUTRONS. Masakatsu Sakisaka (Kōman Univ., Kōbe, Japan). J. Phys. Soc. Japan 14, 554-63(1959) May.

$Be^9(n,2n)Be^8$ and $B^{11}(n,\alpha)Li^8(\beta)Be^8$ reactions induced by 14-Mev neutrons were studied by the method of beryllium and boron loaded nuclear emulsions. In the former reaction, the angular distributions of Be^8 nuclei were strongly peaked backward in the center-of-mass system, suggesting that the direct interaction of the incident neutrons with beryllium—an inelastic scattering process before second neutron emission and a pick-up process probably—had a major contribution to the reaction. The cross sections were measured as 0.18 ± 0.07, 0.03 ± 0.02, 0.11 ± 0.04, and 0.05 ± 0.03 barns for the 3, 5, 7.5, and more than 9 Mev excited states of Be^8, respectively. When 0.17 ± 0.03 barns was cited to the cross section with respect to its ground state, the total (n,2n) cross section was estimated as 0.54 ± 0.09 barns.

The cross section of the latter reaction was measured as 35 ± 7 millibarns in which the contribution of Be^8 in the ground state was not included. Most Li^8 nuclei were found to be left at the states lower than 2.5 Mev in the reaction. The decaying rates of Li^8 to the Be^8 states of 3, 5 and more than 8 Mev were about 75, 15, and 10%, respectively, and the mixing of the allowed transitions of such rates was consistent with the known β spectrum of Li^8. (auth)

15624

EVALUATION OF THE NUCLEAR QUADRUPOLE MOMENT OF N^{14}. Yoshifumi Kato (Osaka Municipal Technical Research Inst.) and Osamu Nakahara (Kyoto Univ.). J. Phys. Soc. Japan 14, 690-1(1959) May.

The nuclear quadrupole moment of N^{14} was evaluated from molecular data using the calculated field gradient. The values obtained are $Q(N^{14}) = 1.08 \times 10^{-26}$ cm^2 for the vibrating nucleus and $Q(N^{14}) = 1.06 \times 10^{-26}$ cm^2 for the static nucleus. (L.T.W.)

15625

ON THE SHAPE OF EVEN ATOMIC NUCLEI. A. Davydov and G. Filippov (Moscow State Univ.). Nuclear Phys. 10, 654-62(1959) May (1).

A nuclear model which consists of a core and of two nucleons in a shelf of angular momentum j is considered. The energy as a function of parameters β and γ is found for various values of the total angular momentum of the nucleons. It is shown that if $j > 3/2$ the shape for minimum energy of the nucleus in the ground state is not axially symmetric. In the limit of very strong coupling of the nucleons to deformations of the nuclear surface, the equilibrium shape of the nucleus approaches one possessing axial symmetry. (auth)

15626

$\beta-\nu$ CORRELATION IN Ne^{23} WITH RESONANCE FLUORESCENCE. N. E. Booth, G. W. Hutchinson, A. M. Segar, G. G. Shute, and D. H. White (Univ. of Birmingham, Eng.). Nuclear Phys. 11, 341-8(1959) May (3).

The correlation between the β rays and those γ rays Doppler-shifted by nuclear recoil to the energy needed for resonance scattering was measured for Ne^{23}. This correlation is directly related to the $\beta-\nu$ correlation for Gamow-Teller negaton emission. The correlation expected depends on the M1, E2 mixing in the gamma transition. With the best estimate of this, the ratio coincidences at 90° to those at 180° should be 0.87 for axial vector and 1.17 for tensor interaction. The experimental result, obtained in about 100 hours of running time, 0.56 ± 0.24, supports axial vector interaction. The results also give a value for the lifetime of the 436 kev level in Na^{23} of $(1.5 \pm 0.3) \times 10^{-10}$ sec. (auth)

15627

INELASTIC SCATTERING OF HIGH ENERGY PROTONS BY B^{11} AND O^{16}. L. Egardt (Univ. of Uppsala). Nuclear Phys. 11, 349-56(1959) May (3).

The differential cross sections for the inelastic scattering to the 4.46-Mev level of B^{11} and to the 6.06- and 6.14-Mev levels of O^{16} are calculated in the extreme L-S coupling picture. The transition to the excited state is described by the free nucleon-nucleon scattering matrix. Only the absorption part of the optical potential is taken into account. Good agreement with experiment is obtained. (auth)

15628

SIGN OF THE NUCLEAR QUADRUPOLE INTERACTION BY OBSERVATION OF POLARIZED GAMMA-GAMMA ANGULAR CORRELATIONS. Samuel M. Harris (Univ. of Illinois, Urbana). Nuclear Phys. 11, 387-99(1959) May (3).

The sign of the nuclear quadrupole interaction cannot be determined by measurement of unpolarized $\gamma-\gamma$ angular correlations. It can, however, be found by measuring the circular polarization of one of the radiations. Appropriate formulas are given to enable the reader to easily calculate the correlation function as a function of crystal orientation in the cases where the two radiations make angles of 90 and 180° with each other, are of multipole order $L \leq 2$, and involve an intermediate state with spin $I \leq 7/2$. For the 90° case, in general, terms enter which are dependent on the sign of the interaction. The application of this technique to unpolarized $\beta-\gamma$ correlations is also considered. (auth)

15629

RADIATIVE DEUTERON CAPTURE $Zn^{64}(d,\gamma)Ga^{66}$. J. H. Carver and G. A. Jones (Atomic Energy Research Establishment, Harwell, Berks, Eng.). Nuclear Phys. 11, 400-10(1959) May (3).

Induced radioactivity methods were used to observe radiative deuteron capture in Zn^{64} for deuteron energies of 3.5 to 4.5 Mev. Observations were made with NaI(Tl) gamma-ray spectrometers used singly and in coincidence, and the 9.5 hour Ga^{66} activity was identified in the presence of an intense 245 day Zn^{65} activity resulting from the Zn^{64} (d,p) and (d,n) reactions. At a deuteron energy of 4.5 Mev, $\sigma(d,\gamma) = 80 \pm 12\ \mu b$ and $\sigma(d,n + d,p) = 0.16 \pm 0.02$ b. The cross section ratio, $\sigma(d,\gamma)/\sigma(d,n + d,p) = 0.50 \pm 0.08 \times 10^{-3}$ is constant for 3.5 to 4.5 Mev deuterons. The magnitudes of the cross sections and their variation with energy are consistent with an interpretation in terms of the statistical decay of a compound nucleus, the radiative probability being calculated from photodisintegration data. (auth)

15630

THE LEVEL STRUCTURE OF Dy^{160}. R. G. Arns, R. E. Sund, and M. L. Wiedenbeck (Univ. of Michigan, Ann Arbor). Nuclear Phys. 11, 411-18(1959) May (3).

Gamma rays in Dy^{160} following beta decay of the 72 day Tb^{160} were studied using coincidence and angular correlation methods. The relative intensity and coincidence measurements confirm the principal features of the decay scheme proposed by Nathan. Angular correlation measurements were made on six cascades. The spin and parity of the 0.087 Mev, 0.964 Mev, and 1.262 Mev levels were found to be 2+, 2+, and 2−, respectively. The measurements favor spins of 4 and 3 for the 0.283 Mev and 1.359 Mev levels. These assignments are in agreement with previous assignments by Ofer. The multipolarities of the main gamma transitions are given. (auth)

15631

ELECTRIC QUADRUPOLE ENHANCEMENT NEAR O^{16}. G. Barton (Clarendon Lab., Oxford). Nuclear Phys. 11, 466-74(1959) May (3).

The core enhancement of E2 effects near O^{16} is calculated on the shell model with configuration mixing. The physical basis of the method is clarified by tracing its connection with Hartree-Fock theory and it is shown that it allows only for the static distortion of the core, but not for the genuine dynamic correlations between the odd particle and the core protons. The calculations cannot correlate, let alone explain the data, which are therefore interpreted as evidence for the importance of long range correlations in the nucleus. (auth)

15632

ON THE ELASTIC p-d SCATTERING AT HIGH ENERGIES. L. Favella and M. Olivetti (Istituto di Fisica dell'Universita and Istituto Nazionale di Fisica Nucleare, Turin). Nuovo cimento (10) 11, 679-92 (1959) Mar. 1.

The validity of the impulse approximation in the elastic p-d scattering for protons of 310 Mev was investigated. The numerical results for the differential cross sections and polarizations as functions of the angle of scattering show clearly that this approximation is inadequate for the prediction of the additivity of these observables as it has been proved experimentally. The reason of the failure is due to the large nuclear two-body interaction in the triplet states. (auth)

15633

INTRODUCTION OF A NEUTRAL PSEUDOSCALAR FIELD AND A POSSIBLE CONNECTION BETWEEN STRANGENESS AND PARITY. K. Nishijima (Inst. for Advanced Study, Princeton, N. J.). Nuovo cimento (10) 11, 698-710(1959) Mar. 1.

A neutral pseudoscalar field with vanishing rest mass is introduced. The first thing sought was the condition guaranteeing the vanishing rest mass, which turns out to be an invariance requirement under a certain kind of gauge transformation. Then assigning an appropriate transformation to each field one can restrict the possible forms of weak interactions. The main results obtained are as follows: (1) the change of strangeness necessarily requires the violation of both parity and charge conjugation; (2) the change of the number of electrons or of muons necessarily violates parity and charge conjugation; (3) strangeness can change only by unity in weak interactions. (auth)

15634

ON THE SPIN DEPENDENCE OF THE Λ-N INTERACTION. L. E. Picasso and S. Rosati (Istituto di Fisica dell'Universita, Pisa, Italy and Istituto Nazionale di Fisica Nucleare, Pisa, Italy). Nuovo cimento (10) 11, 711-17(1959) Mar. 1.

The ratio w^j between the lifetimes for the decays $H_\Lambda^3 \rightarrow He^3 + \pi^-$ and $H_\Lambda^3 \rightarrow D + p + \pi^-$ has been calculated as a function of the spin j of the H_Λ^3 ($j = 1/2$ or $j = 3/2$). The experimental value $w_{exp} \lesssim 1$ favors $j = 1/2$, showing that the Λ-N potential is more attractive in the singlet than in the triplet state. This result does not depend critically on the choice of the wave functions, because $w^{3/2}/w^{1/2}$ is independent of it. (auth)

15635

HYPERFRAGMENTS FROM THE Ξ PARTICLE AND THE DETERMINATION OF THE Ξ PARITY. J. Szymański (Inst. of Nuclear Research, Warsaw). Nuovo cimento (10) 11, 730-2(1959) Mar. 1.

Some possible hyperfragments from Ξ particles are predicted and conclusions are drawn as to the parity of Ξ according to each hyperfragment. If Ξ_n^0 and Ξ_p^0 do not exist and at least one neutral hyperfragment decays into $2\Lambda + y$, then Ξ is bound in the s = 1 state and parity = 1. If a neutral hyperfragment decaying into $2\Lambda + \gamma$ does not exist, then the Ξ N forces are too weak for a bound state to exist or there are two possibilities: ground state S = 0 with any parity, or ground state S = 1, P = −1. If charged hyperfragments exist and $2\Lambda + \gamma$ decays are observed with a frequency greater than the frequency of occurrence of charged hyperfragments, then some part of the $2\Lambda + \gamma$ decay must come from the T = 0 state and Ξ is bound in the s = 1 state, and has parity = 1. In the case of the same frequency or small statistics no conclusion can be drawn. The possibility of experimental confirmation of one of the above cases is discussed, and an analogy between the Ξ N hyperfragment and the two nucleon system is discussed. (T.R.H.)

15636

ON K⁻-HYDROGEN INTERACTIONS. W. Alles, N. N. Biswas, M. Ceccarelli, R. Gessaroli, and G. Quareni (Università, Bologna); M. Göing, K. Gottstein, W. Püschel, J. Tietge, and G. T. Zorn (Max-Planck-Institut für Physik and Astrophysik, Munich); J. Crussard and J. Hennessy (Ecole Polytechnique, Paris); and G. Dascola and S. Mora (Università, Parma, Italy). Nuovo cimento (10) 11, 771-5(1959) Mar. 16.

Experimental data are given on the interaction of K^--mesons with hydrogen nuclei. These emulsion data agree with the new bubble chamber data. They indicate an essentially isotropic angular distribution, both for scattering and for absorption events, a slight decrease of the elastic scattering cross section with energy and a large one of the absorption cross section. (auth)

15637

ON THE DECAY OF XENON 133. S. Jha, H. G. Devare, M. Narayana Rao, and R. M. Singru (Tata Inst. of Fundamental Research, Bombay). Nuovo cimento (10) 11, 788-92(1959) Mar. 16.

The γ-rays from Xe^{133} were studied in a scintillation spectrometer. The γ-rays have the energy of 80, 160, 300, and 380 kev with the relative intensity 1, $1.4 \cdot 10^{-2}$, $8.4 \cdot 10^{-4}$, and $4.3 \cdot 10^{-4}$. By studying the 80 kev γ-rays in coincidence, the relative intensity of the cascade and the cross-over transition from the 160 kev state was found. Taking this into account, the log ft values for the β-transition to the 80, 160, and 380 kev states were calculated to be 5.6, 7, and 5.7, respectively. (auth)

15638

μ^--CAPTURE IN LIGHT NUCLEI. E. G. Beltrametti (Università, Genoa and Istituto Nazionale di Fisica Nucleare, Genoa) and L. A. Radicati (Università, Pisa, Italy and Istituto Nazionale di Fisica Nucleare, Pisa, Italy). Nuovo cimento (10) 11, 793-9(1959) Mar. 16.

A shell model analysis, of the μ-capture by light nuclei without heavy particle emission, is given. Some experiments are suggested to measure the coupling constant and the relative contribution of the Gamow-Teller and Fermi interactions. A detailed study is presented of μ^--capture in He^3, Li^6, and O^{16}. (auth)

15639

L/K-CAPTURE RATIO IN ^{195}Au. A. Bisi, E. Germagnoli, and L. Zappa (Istituto di Fisica del Politecnico, Milan). Nuovo cimento (10) 11, 843-9(1959) Mar. 16.

The L/K-capture ratio in orbital electron capture decay of Au^{195} was investigated by using a measurement procedure based on coincidence techniques. It was found for the transition to the 128 kev level of Pt^{195}: $P_L/P_K = 5.5 \pm 0.9$ which corresponds to a transition energy of 106 kev. In addition a determination of the half-life of Au^{195} and of the K conversion coefficient of the 97 kev transition was made. It was obtained $T_{1/2} = (192 \pm 5)$ d and $\alpha_K = 8.4 \pm 0.5$. The proposed decay scheme agrees quite well with previous results. (auth)

15640

NUCLEON CORRELATION EFFECTS IN HIGH ENERGY ELECTRON SCATTERING. R. Gatto (Università, Rome, and Istituto Nazionale di Fisica Nucleare, Rome). Nuovo cimento (10) 12, 70-83(1959) Apr. 1.

A detailed investigation is carried out of the role of nucleon-nucleon correlations in the inelastic scattering of high energy electrons by nuclei summed over all nuclear excitations. It is concluded that the dominant correlation effect is that caused by the exclusion principle and the differential cross section can be rather accurately predicted independently of the details of the nuclear dynamics. (auth)

15641

NUCLEAR INTERACTIONS OF NEUTRAL K-MESONS OF LONG LIFETIME. II. V. Bisi, R. Cester, A. Debenedetti, C. M. Garelli, N. Margem, B. Quassiati, and M. Vigone (Università, Turin, and Istituto Nazionale di Fisica Nucleare, Turin, Italy). Nuovo cimento (10) 12, 16-26(1959) Apr. 1.

This work follows a previous study of the interactions of long lived neutral K-meson. The increased statistics allows us to check the results previously obtained and to determine the cross section for charge exchange of the θ_2^0 particles in the eigenstate of strangeness —1. (auth)

15642

INTERACTION OF 4.2 Gev π^- MESONS WITH NUCLEAR EMULSION. P. Abrahamson, J. Ben-Arieh, and G. Yekutieli (The Weizmann Inst. of Science, Rehovoth, Israel) and G. Alexander (The Weizmann Inst. of Science, Rehovoth, Israel, and Atomic Energy Establishment, Rehovoth, Israel). Nuovo cimento (10) 12, 27-37(1959) Apr. 1.

1425 interactions of 4.2 Bev π^--mesons with emulsion nuclei, found by area scanning were studied. A total mean free path of (32.4 ± 4) cm was obtained. The mean multiplicity per star was found to be 1.72 for charged pions and 2.48 for fast protons. These figures were compared with the statistical model of Fermi. The angular distributions and energy spectra of the secondary particles were obtained and confronted with the corresponding results for 5 Bev π^--p interactions. (auth)

15643

ON THE (γ,pn) REACTION IN S^{32}. U. Farinelli, F. Ferrero, S. Ferroni, R. Malvano, and E. Silva (Universita, Turin, and Istituto Nazionale di Fisica Nucleare, Turin, Italy). Nuovo cimento (10) 12, 89-90(1959) Apr. 1.

The (γ,pn) process in S^{32} was measured along with measurement of the (γ,n) reaction and the fast neutron component. The (γ,pn) cross section seems to present a very broad maximum above 30 Mev. The (γ,n) contribution becomes very small at 30 Mev while the fast neutron component ($E_n > 5.5$ Mev) is of the order of the $[(\gamma,n) + (\gamma,np)]$ cross section. (T.R.H.)

15644

ON THE OBSERVATIONS OF π MESONS EMITTED IN THE INTERACTION IN EMULSION OF K^--MESONS. M. C. Amerighi, F. Baldassare, M. Beniston, A. Bonetti, D. H. Davis, M. Di Corato, C. Dilworth, E. Ferreira, E. Frota-Pessoa, W. B. Lasich, N. Naina, M. Rene, J. Sacton, and A. E. Sichirollo (Universita, Bari, Italy; Université Libre, Brussels; University Coll., London; Università, Milan; and Istituto Nazionale di Fisica Nucleare, Milan). Nuovo cimento (10) 12, 91-5(1959) Apr. 1.

Among 1148 K^- stars observed in an Ilford K5 stack, 390 π-mesons and 12 doubtful π-mesons were found. A π/K^- ratio of $[39.2 + 1.3 \pm 2]$ % is given, higher than previous results. This value is subject to statistical fluctuations, errors in solid angle correction, and observational loss. Comparison with previous work shows that the scanning loss was chiefly among high-energy π-mesons in $K\sigma_1$ stars and multi-pronged events. This implies a larger proportion of Λ^0 mesons produced in $K^- + N$ interactions, and that π-meson absorption is smaller than estimated. (T.R.H.)

15645

THE ENERGY LEVELS OF F^{18}. S. Hinds and R. Middleton (Atomic Weapons Research Establishment, Aldermaston, Berks, Eng.). Proc. Phys. Soc. (London) 73, 721-6(1959) May.

The energy levels of F^{18} were investigated using the reactions $O^{16}(He^3,p)F^{18}$ and $F^{19}(He^3,\alpha)F^{18}$. In both cases magnetic analysis was employed and the incident He^3 energy was 5.9 Mev. The excitation energies of 40 levels were determined below 7.493 Mev. (auth)

15646

THE ENERGY LEVELS OF O^{15}, Mg^{23}, AND Si^{27}. S. Hinds and R. Middleton (Atomic Weapons Research Establishment, Aldermaston, Berks, Eng.). Proc. Phys. Soc. (London) 73, 727-32(1959) May.

The reactions $O^{16}(He^3,\alpha)O^{15}$, $Mg^{24}(He^3,\alpha)Mg^{23}$ and $Si^{28}(He^3,\alpha)Si^{27}$ were investigated at an incident energy of 5.8 Mev by magnetic analysis. The following levels were observed: O^{15}, 5.174, 5.233 Mev; Mg^{23}, 0.451, 2.048, 2.356, 2.712, 2.768, 2.904, 3.792, 3.856, 3.968, 4.353 Mev; Si^{27}, 0.782, 0.958, 2.165, 2.651, 2.866, 2.908, 3.540, 3.800, (4.13) Mev. (auth)

15647

THE REACTIONS $Al^{27}(p,p')Al^{27}$ AND $Al^{27}(\alpha,p)Si^{30}$. F. de S. Barros, P. D. Forsyth, A. A. Jaffe, and I. J. Taylor (Univ. of Manchester, Eng.). Proc. Phys. Soc. (London) 73, 793-9(1959) May.

The reactions $Al^{27}(p,p')Al^{27}$ and $Al^{27}(\alpha,p)Si^{30}$ were studied at 5 Mev incident energy using a high resolution broad range magnetic spectrograph. Angular distributions of several of the proton groups from each of the reactions were determined and the results suggest that some of the final states are formed by direct processes. The excitations of the first four states of Si^{30} were found to be 2.258 ± 0.006, 3.518 ± 0.007, 3.798 ± 0.009, and 4.85 ± 0.01 Mev. (auth)

15648

A NOTE ON THE NUCLEAR REACTIONS IN STARS. Seitaro Nakamura and Takashi Ohmura (Univ. of Tokyo) and Mitsuo Taketani (Rikkyo Univ., Tokyo). Progr. Theoret. Phys. (Kyoto) 21, 18-28(1959) Jan.

Building up elements in stars by helium capture, neutron capture, and proton capture is considered. A possible model for the formation of the iron peak is presented. A new neutron source is suggested. (auth)

15649

INTERPRETATION OF THE OPTICAL MODEL IN NUCLEAR REACTIONS. Satio Hayakawa, Tatuya Sasakawa, Kazuhisa Tomita, Masaru Yasuno, and Mario Yokota (Kyoto Univ.). Progr. Theoret. Phys. (Kyoto) 21, 85-97(1959) Jan.

The theoretical basis of the nuclear optical model is investigated for the elastic scattering of neutrons at low energies. It is argued in connection with statistical mechanics of irreversible processes that the characteristic feature of the optical model can be revealed by means of wave packets whose energy spread is wide enough to cover many compound levels. The giant resonance of the Lorentzian shape is found to result owing to fluctuations in the interaction potential which is experienced by an incident nucleon in a target nucleus. The imaginary part of the optical potential or the half width of a giant resonance is expressed by the product of the second moment and the correlation time. The latter is closely related to the concept of portée introduced by Bloch, with whom we share the same opinion in many respects. The correlation time is shown by our method to reveal a feature of the fluctuations and can be evaluated, if the fourth moment is known. (auth)

15650

PROPERTIES OF NUCLEAR FORCES INDICATED BY d(γ,p)n. Shih-Hui Hsieh (Nagoya Univ., Japan). Progr. Theoret. Phys. (Kyoto) 21, 185-206(1959) Jan.

Continued from the previous works some properties of nuclear forces are illustrated in the analysis of d(γ,p)n process. Especially a rather repulsive property of ^1E, the strong tensor forces of ^3O and ^3E are pointed out, and the detailed forms of the potentials are discussed. Comparison with nucleon-nucleon scattering is made. Also the applicability of pion theoretical potential is investigated, and it shown that its applicability is rather good. (auth)

15651

Q-VALUE DEPENDENCE OF DECAY PROBABILITY. K. Fujii and K. Iwata (Hokkaido Univ., Sapporo). Progr. Theoret. Phys. (Kyoto) 21, 207-9(1959) Jan.

$\pi \to e + \nu$, $\pi \to \mu + \nu$, $\Xi \to \Lambda + \pi$, and $\Xi \to N + \pi$ decays are used as examples in showing that the decay probability of a particle (into two decay products) is a decreasing function of Q-value. Even a slight difference of Q-value seems to have an effect on the branching ratio of two body decays occurring from a common parent. Transition matrices are plotted as a function of Q. (A.C.)

15652

ON THE TRIPLE ANGULAR CORRELATIONS IN (p,γ) REACTIONS. Lennart Simons (Univ. of Helsingfors, Finland). Soc. Sci. Fennica Commentationes Phys.-Math. 23, 12p.(1959).

Triple angular correlation functions are calculated and compared with the results of the triple angular correlation measurements for the reactions $Na^{23}(p,\gamma)Mg^{24}$ and $Si^{32}(p,\gamma)P^{31}$. For the former reaction the 515 kev level has $J = 2^-$ and the 679 kev level $J = 3^+$. For the latter reaction the 760 kev resonance level has spin $5/2^+$, the 3.51 Mev level $3/2^+$ (possibly $1/2^+$) and the 2.23 Mev level $5/2^+$. (auth)

15653

DEFORMATION OF LIGHT NUCLEI. Yü Ming, Teng Tseya-hsien, Tsjou Hsiao-ch'eng, and Li Yen-kuo (Academy of Sciences, China). Wu Li Hsüeh Pao 14, 449-68(1958). (In Chinese)

The bond between the ground and excited states of light deformed nuclei was studied on the basis of the generalized model. The studies considered the effects of pair energies and rotating perturbations. The data obtained indicated considerable influence of rotating perturbations on the nuclear deformation. Moreover, in some cases it changed the order of the energy levels. (tr-auth)

15654

THE SPIN-ORBITAL BOND IN NUCLEI. Ch'u Liang-Yüan (Academy of Sciences, China). Wu Li Hsüeh Pao 14, 469-78(1958). (In Chinese)

The distances between the reversible doublet state energy levels were estimated by means of two-body phase shifts. The results obtained are in good agreement with experimental data. The ratio of nuclear forces interacting between two nucleons was found on the basis of the nuclear spin-orbital bond. (tr-auth)

15655

E3 γ TRANSITIONS IN NUCLEI. Li Yang-kuo (Academy of Sciences, China). Wu Li Hsüeh Pao 14, 479-87(1958). (In Chinese)

A generalized nuclear model was employed in studies of the E3 γ transition between $7/2^+ \rightleftharpoons 1/2^-$. Certain configurations are mixed due to the nuclear forces and the nucleonic bonds with the nuclear surfaces. The estimated data show that $\lambda = 2$ phonons play the most important part. The factor F is found between 0.01 and 0.1 and is of the same order as the factor F in other transitions. (tr-auth)

15656

ON SUPERFINE STRUCTURE OF La^{57}. Yü Yu-weng and Chang Chung-hua (Academy of Sciences, China). Wu Li Hsüeh Pao 14, 488-96(1958). (In Chinese)

An experimentally measured ratio of hyperfine structure coefficients is three times higher than the theoretical data. The effects of mixed configurations were introduced in order to approximate the experimental and theoretical results. Detailed calculations were made of $(6s)^2(5d)$ with the additional configuration (6s)(7s)(5d). The results obtained agree better than in the case of the pure configuration; however, they are far from being in complete agreement. Investigations of configuration $(5d)^2(6s)$ showed a comparatively smaller energy with higher percentage contribution. Hence, in order to obtain a better correlation with experimental data, a larger contribution of the configuration $(5d)^2(6s)$ (about 0.36) should be considered. This should produce better theoretical results, but they still do not coincide with the experimental results. (tr-auth)

Theory

15657 NRL-5315

Naval Research Lab., Washington, D. C.

DAMPING THEORY. R. C. O'Rourke. Apr. 3, 1959. 18p.

A time-dependent formulation of Heitler's damping theory which includes the Wigner-Weisskopf theory is presented. No results are obtained which are not implicit in the work of these authors but it is felt that the use of Laplace transform techniques is more direct than the Fourier integral techniques of Heitler. Also the case of mixed states is formulated whereas only pure states are usually discussed in the conventional treatments. This type of work is being applied to various line-broadening problems in high-temperature physics. (auth)

15658

MOTION EQUATIONS IN LINEAR FIELD THEORY. C. Jankiewicz (Universität, Wroclaw, Poland and

Polnischen Akademie der Wissenschaften, Wrocław, Poland). Bull. acad. polon. sci., Sér. sci. math. astron. et phys. 7, 175-8(1959). (In German)

It is shown that the motion equations of particles possessing electric charge and considered as field singularities result from the equations derived by variational principles from arbitrary variations of the electromagnetic potentials and functions, characterized by the system of calculation. (tr-auth)

15659

BEHAVIOR OF IONIZED INTERSTELLAR HYDROGEN IN THE GALAXY. George Courtès. Compt. rend. 248, 2953-5(1959) May 25. (In French)

The regions of ionized hydrogen recently studied (Compt. rend. 238, 1971(1953)) are localized near spiral arms and permit, in certain cases, the position of exciting stars to be better defined with reference to these spiral arms. (tr-auth)

15660

RADIATIVE CORRECTIONS TO BREMSSTRAHLUNG. A. N. Mitra (Muslim Univ., Aligarh, India) and P. Narayanaswamy and L. K. Pande (Univ. of Delhi). Nuclear Phys. 10, 629-53(1959) May (1).

The second order radiative corrections to bremsstrahlung were evaluated by a straightforward application of Feynman-Dyson techniques, taking all the possible effects into account. The results are given in simplified forms for certain relativistic and extreme relativistic regions discussed in the text. The cross-section for double bremsstrahlung was also evaluated in various limits, in order to cancel out the "infrared" terms appearing in the second order corrections. The result for the extreme relativistic limit seems to disagree with one recently obtained by Fomin using "mass operator" techniques. (auth)

15661

A THEORETICAL APPROACH TO LOW ENERGY PION PHYSICS. B. Bosco, S. Fubini, and A. Stanghellini (CERN, Geneva). Nuclear Phys. 10, 663-87(1959) May (1).

The method starts from a determination of the pion-nucleon scattering state vector in terms of the physical nucleon state vector and of the renormalized coupling constant. Such a determination can be performed in the one-meson approximation and leads in a simple and natural way to the same results as the Chew and Low approach to scattering and photoproduction. The method is then applied to the problem of radiative pion-nucleon scattering where an expression is obtained for the T matrix in a closed form which has the same degree of validity as the result for photoproduction. Although the method has its natural field of application in the framework of the static model, it can be applied to obtain the recoil effects due to the motion of the physical nucleon. In the case of pion-nucleon scattering results are obtained closely analogous to those obtained in the framework of relativistic dispersion theory. (auth)

15662

THE SOLUTION OF THE BETHE-GOLDSTONE EQUATION FOR NON-ZERO CENTRE-OF-MASS MOMENTUM. E. Werner (Universität, Saarland, Saarbücken, Ger.). Nuclear Phys. 10, 688-97(1959) May (1).

The problem of the motion of two particles with non-zero center-of-mass momentum is discussed for nuclear matter. In a mathematically rigorous treatment the equation of motion is reduced to a set of integro-differential equations that couple together the contributions of the various angular momentum substates present in the total wave-function. (auth)

15663

SOME RESULTS OF ANALYTIC FUNCTIONS IN LOCAL THEORY. Daniel J. Kleitman (Inst. for Theoretical Physics, Copenhagen). Nuclear Phys. 11, 459-65(1959) May (3).

Lorentz invariance, local commutativity, and the absence of negative mass states imply that the vacuum expectation value and the Fourier transform of the retarded commutator of a product of field operators are boundary values of analytic functions. The cases of four and five local scalar fields are investigated in the spirit of the approach of Källén and Wightman. It is shown that the domain of analyticity of the vacuum expectation value in x-space contains that of the retarded commutator in p-space. A computation of the real points of these domains is discussed in an appendix. (auth)

15664

TO INTRODUCE THE IMPACT PARAMETER INTO THE ANALYSIS OF MULTIPLE MESON PROCESSES. H. Ezawa (Univ. of Tokyo). Nuovo cimento (10) 11, 745-59(1959) Mar. 16.

To introduce the concept of impact parameter into the analysis of high energy events seems possible and also useful. Showing the inadequacy of Fermi's theory with impact parameter, another way is proposed to infer the impact parameter for each event in the emulsion from the experimentally observable quantities. The impact parameters introduced in this way have admissible order of magnitude and are shown to have a somewhat definite functional relation with the multiplicity of mesons whose plot vs. primary energy has been known to suffer large fluctuation. Consistency with the uncertainty principle is also discussed. (auth)

15665

ON THE INTERACTION HAMILTONIAN OF SYMMETRIC PSEUDOSCALAR MESON THEORY. V. Singh (Tata Inst. of Fundamental Research, Bombay). Nuovo cimento (10) 11, 800-4(1959) Mar. 16.

The equivalence of the pseudoscalar and pseudovector couplings of pseudoscalar pions to nucleons is investigated in a straightforward manner without making any use of a canonical transformation as was done previously. PS-couplings is shown to be equivalent, as far as the S-matrix is concerned, to the usual p-wave and s-wave terns along with some non-local terms whose interpretation is not yet clear. (auth)

15666

NOTE ON POSSIBLE PARITY NON-CONSERVATION IN STRONG INTERACTIONS. L. M. Brown (Università, Milan and Istituto Nazionale di Fisica Nucleare, Milan). Nuovo cimento (10) 11, 884-6(1959) Mar. 16.

As experimental tests of the conservation of parity in strong interactions have not been completed, it may be of interest to observe that a principle which has already been successfully applied to the theory of weak interactions may allow a distinction to be made between the strong interaction terms of the Lagrangian which do, and those which do not conserve parity. The principle of chirality invariance, or its equivalent expression in terms of the two-component fermion theory, is considered. (W.D.M.)

15667

INTERACTIONS OF THE HEAVY NUCLEI OF COSMIC RAYS IN CARBON. Y. Hirashima (Rikkyo Univ., Tokyo). Nuovo cimento (10) 12, 1-15(1959) Apr. 1.

The fragmentation probabilities of the heavy nuclei of cosmic rays have been investigated in carbon. Emulsion chambers consisting of carbon and photographic nuclear emulsions exposed in Japan ($\lambda = 25°N$) were used. The charges of the heavy nuclei with $Z \geq 3$ were determined by measuring the δ-ray densities. The fragmentation probabilities into the light nuclei are $P_{HL} = 0.35 \pm 0.08$ and $P_{ML} = 0.35 \pm 0.08$. The abundances at the balloon flight altitudes observed by several groups were extrapolated to the top of the atmosphere by using the fragmentation probabilities in carbon obtained in the present work. The ratio of the light nuclei to the medium nuclei at the top of the atmosphere is probably in the range from ~ 0.1 to ~ 0.2. (auth)

15668

CUT-OFF MODELS OF THE PROTON. R. Hofstadter (CERN, Geneva). Nuovo cimento (10) 12, 63-9(1959) Apr. 1.

It is demonstrated that the form factor fitting the electron-proton scattering data, which could formerly be described by an exponential density distribution, can also be given entirely equivalently by one of several cut-off proton models. Such models have a theoretically desirable asymptotic behavior, according to present ideas of field theory. (auth)

15669

EXACTLY RENORMALIZABLE MODEL IN QUANTUM FIELD THEORY. III. RENORMALIZATION IN THE CASE OF TWO V PARTICLES. Th. W. Ruijgrok (Rijksuniversiteit, Utrecht). Physica 25, 357-64(1959) May.

A simpler formulation of the renormalized Schrödinger equation is given for the model discussed previously. The renormalization is extended to the case of more than one heavy particle. The final results contain no divergences and are easily visualized in terms of diagrams which are calculated using only the renormalized coupling constants. It is conceivable that this formulation of the theory also applies to more realistic models. (auth)

15670

THE SCATTERING OF ALPHA PARTICLES BY HELIUM. D. J. Bredin (Queen's Univ., Belfast); W. E. Burcham and J. S. C. McKee (Univ. of Birmingham, Eng.); D. Evans and D. J. Prowse (Univ. of Bristol, Eng.); W. M. Gibson (CERN, Geneva); J. Rotblat (St. Bartholomew's Hospital, London); and J. N. Snyder (Univ. of Illinois, Urbana). Proc. Roy. Soc. (London) A251, 143-55(1959) May 26.

In order to obtain information about the levels of even spin and parity of Be^8 at energies above 11 Mev, the differential cross section for the α-particle—helium elastic scattering has been measured at a series of beam energies from 23.1 to 38.4 Mev, for many c.m.s. angles between 30 and 90°. Phase shifts up to $L = 8$ have been calculated for each energy. Combining these results with previous figures for lower energies, the phase shifts δ_0, δ_2, and δ_4 are thus known as functions of incident energy from 0.15 Mev to 38.4 Mev. The behavior of the phase shift δ_4 confirms the existence of a previously suggested level with $I = 4$ at an excitation energy of about 11.4 Mev in Be^8. The phase shifts δ_6 and δ_8 are small, as expected if the rotational series of levels in Be^8 terminates with $I = 4$. (auth)

15671

PROTON-PROTON INTERACTIONS AT 970 Mev. A. P. Batson, B. B. Culwick, J. G. Hill, and L. Riddiford (Univ. of Birmingham, Eng.). Proc. Roy. Soc. (London) A251, 218-32(1959) May 26.

A 970 Mev proton beam has been passed through a hydrogen-filled diffusion cloud chamber located in a pulsed magnetic field, and a total of 1029 proton-proton interactions observed. The cross sections for the possible reactions, and the angular distribution for the elastic scattering, have been determined. The effects of scanning losses on these quantities are discussed. The results from 273 events of the type $p + p \rightarrow n + p + \pi^+$, and 72 events of the type $p + p \rightarrow p + p + \pi^0$, have been calculated in detail. They are compared with the predictions of the 'isobar' theory of pion production, in which it is postulated that the production of pions occurs through an intermediate state of isotopic spin $T = 3/2$. The results for positive pion production are in good agreement with this hypothesis, and disagree markedly with the predictions of a purely statistical theory. The results for neutral pion production do not agree well with the predictions of the isobar theory. (auth)

15672

PROTON-DEUTERON INTERACTIONS AT 970 Mev. A. P. Batson, B. B. Culwick, H. B. Klepp, and L. Riddiford (Univ. of Birmingham, Eng.). Proc. Roy. Soc. (London) A251, 233-46(1959) May 26.

A high-pressure diffusion cloud chamber has been used to study the interactions of 970 Mev protons from the Birmingham synchrotron with deuterium. Analysis of the 569 collisions observed indicates that at this energy the deuteron behaves as if it were composed of two free nucleons. The properties of proton-proton and proton-neutron scattering have been determined on this assumption. An estimate is made of the extent of the 'shadowing' of each nucleon in the deuteron by the other. The partial cross sections for p-p and p-n elastic scattering have been determined, as have also the values for the five possible single meson production processes. They have the following 'best' values: (1) $(p + p \rightarrow p + p) = 25.9 \pm 1.7$ mb, (2) $(p + n \rightarrow p + n) = 16.2 \pm 3.5$ mb, (3) $(p + p \rightarrow p + p + \pi^0) = 5.4 \pm 1.0$ mb, (4) $(p + p \rightarrow n + p + \pi^+) = 15.6 \pm 1.7$ mb, (5) $(p + n \rightarrow p + n + \pi^0) = 14.3 \pm 3.5$ mb, (6) $(p + n \rightarrow p + p + \pi^-) = 2.7 \pm 0.6$ mb, (7) $(p + n \rightarrow n + n + \pi^+) = 4.3 \pm 1.1$ mb. Double meson production and reactions involving secondary deuterons are not important. The cross sections (1), (2), (3), (4), and (5) are consistent with values extrapolated from data at energies below 660 Mev by Russian workers. Knowledge of the other cross sections (6) and (7) makes possible a test of the validity of the charge independence of nuclear forces. The present results are not in good agreement with this. The results for inelastic scattering indicate that, assuming charge independence, the formation of excited nucleons of isotopic spin 3/2 does not dominate the process of pion production. This is also true for the Russian data. Twelve cases of double meson production were observed. The angular distribution of proton-neutron elastic scattering has the form expected from lower energy data. (auth)

15673

OCTUPOLE TYPE DEFORMATION OF NUCLEAR SURFACE. Shôta Suekane (Osaka City Univ.). Progr. Theoret. Phys. (Kyoto) 21, 74-84(1959) Jan.

The shell structure dependence of the surface rigidity to nuclear octupole type deformation is examined. In order to calculate the energy change due to octupole type deformation, a coordinate transformation which transforms a deformed surface into a spherical one is introduced. The results of the calculations are in good agreement with the trend of experimental data suggested by low lying odd parity states of even-even nuclei and display a characteristic shell structure dependence as well as quadrupole type deformation. According to the deformed potential model, it is shown that octupole type deformations are closely connected with quadrupole type deformations. This fact may play an important role in determining the spin values of low lying odd parity states of even-even nuclei and in understanding a mechanism of asymmetric fission. (auth)

15674
NATURES OF NUCLEAR FORCES INDICATED BY THE PHOTODISINTEGRATION OF THE DEUTERON. IV. S. H. Hsieh (Nagoya Univ., Japan). Progr. Theoret. Phys. (Kyoto) 21, 211-12(1959) Jan.

Large differences appear in the computation of d(γ,p)n processes at $E_\gamma \simeq 90$ Mev due to the different phase shifts which can account for 170-Mev p-p scattering data. Four sets of phase shifts which are fitted to 170 Mev p-p scattering data are tabulated and the calculated results on the photodisintegration of the deuteron at $E_\gamma = 87$ Mev by these phase shifts are given. (A.C.)

RADIATION EFFECTS ON MATERIALS

Refer also to abstract 15409.

15675 AD-202691
Stevens Inst. of Tech., Hoboken, N. J.
UNCLASSIFIED LITERATURE SURVEY OF THE EFFECTS OF NUCLEAR RADIATION TO ELECTRON TUBE MATERIALS. Quarterly Report Period, March 1, 1958 to May 31, 1958. E. R. Johnson. 16p. DA Project No. 3-99-13-000. Contract DA-36-039-SC-73146.

Bombardment of glass surfaces with high energy radiation will release CO_2, the amount depending upon the mass of the glass exposed. It is reported that alumina ceramics show no structural changes after exposure to an integrated dose of 10^{20} nvt. Borosilicate glass containing 8% boron shows large cracks and fissures after exposure to 5×10^{15} nvt. (auth)

15676 AD-208788
Stevens Inst. of Tech., Hoboken, N. J.
UNCLASSIFIED LITERATURE SURVEY ON THE EFFECTS OF NUCLEAR RADIATION TO ELECTRON TUBE MATERIALS. Quarterly Report [for] May 31, 1958 to September 1, 1958. E. R. Johnson. 17p. SC Project No. -112B. Contract DA-36-039-SC-73146.

Glass tubes containing boron when irradiated with neutrons show a sharp rise in temperature attaining a maximum of 537°C. The rise in temperature is proportional to the boron content. Reduction of the cathode by CO liberated from the walls of glass tubing is discussed. Nonex glass electron tubes when irradiated for a total integrated dose of 10^{16} nvt show no cracks or fissures. (auth)

15677 AD-211232
American Can Co., Barrington, Ill.
EFFECT OF RADIATION ON CAN ENAMELS. Report No. 3 (Annual) [for] May 29, 1957—May 29, 1958. G. B. Pratt and A. C. Wilbur. 28p. Project No. 7-84-01-002. Contract DA-19-129-QM-968.

For cans of irradiated chili, cherries, and beef, some enamels did not appear adversely affected after several months' storage. Vacuum loss appeared in all cans during irradiation. (auth)

15678 AFCRC-TN-58-572
Stanford Research Inst., [Menlo Park, Calif.].
RESEARCH ON EFFECTS OF NUCLEAR RADIATION ON DIELECTRICS AND MAGNETICS. Scientific Report No. 1. S. I. Taimuty and C. A. Rosen. Oct. 31, 1958. 14p. Contract No. AF19(604)-4141. (AD-160886).

Preliminary results of a survey of the literature on the effects of nuclear radiation on magnetic alloys, ferrites, ferroelectric materials, and quartz are presented. Of these materials, quartz has received the most attention, followed by magnetic alloys, ferrites, and ferroelectric materials, in that order. In general, the most marked changes produced by radiation occur in structure-sensitive properties, suggesting changes in the degree of order in the material. The characteristics of a magnetic hysteresigraph for use with toroids at frequencies up to 100 kc are described. The upper frequency limit of the apparatus in its present form is determined by the characteristics of the power amplifier and the R-C integrating circuit and the heating and oscillatory behavior (at saturation) of some of the core materials. These limitations are being studied to establish the optimum geometry and operating range of the test cores. (auth)

15679 CRFD-825
Atomic Energy of Canada Ltd., Chalk River, Ont.
UO_2 IRRADIATIONS OF SHORT DURATION. A. S. Bain and J. A. L. Robertson. Apr. 1959. 56p. (AECL-806). $1.50(AECL).

The "Hydraulic Rabbit" in the NRX Reactor provides the means for subjecting fuel specimens to irradiations of short, and controlled duration. This paper describes the observations made on 47 UO_2 specimens, prepared by different methods. These experiments illustrate the value of the "Hydraulic Rabbit" and indicate some of the problems that can be investigated using it. Its ability to provide short irradiations makes it complementary to the conventional "loops" for testing fuel elements. To some extent the present specimens must be regarded as exploratory, providing necessary experience in the application of such a method. However, the marked difference in appearance of UO_2 due to melting has been demonstrated, and the heat ratings associated with melting and grain growth have been obtained. The appearance of the irradiated oxide has been interpreted to show that a) for the dimensions and heat ratings studied, variations in the assembled diametral clearance of 0.003 to 0.014 in. have very little effect on the fuel temperature, and b) the thermal conductivity of the UO_2 does not change during irradiations of 1 to 40 minutes. (auth)

15680 CRMet-827
Atomic Energy of Canada Ltd., Chalk River, Ont.
THE EFFECT OF NEUTRON IRRADIATION ON THE TENSILE PROPERTIES OF ZIRCALOY-2. L. M. Howe

and W. R. Thomas. Mar. 1959. 38p. (AECL-809). $1.00(AECL).

Tensile specimens of annealed, 13.1% cold-worked, and tempered 25.5% cold-worked Zircaloy-2 were irradiated at 220 and 280°C with integrated fast-neutron fluxes of 3.6×10^{19}n/cm^2 and 2.7×10^{20}n/cm^2, respectively. Post-irradiation tensile tests performed at room temperature and 280°C showed that considerable irradiation hardening occurred in all the irradiated material. This was characterized by an increase in the proportional limit, yield stress, and ultimate tensile strength, and a decrease in the total and uniform per cent elongations. The amount of irradiation hardening increased with increasing fast-neutron flux, but appeared to saturate before a fast-neutron flux of 2.7×10^{20}n/cm^2. The per cent changes in mechanical properties as a result of the irradiation were greater in the annealed material than in the cold-worked material. The tensile properties of irradiated 13.1% cold-worked material were almost identical to those for the irradiated tempered 25.5% cold-worked material for both levels of irradiation. A yield point was developed in irradiated annealed material tested at 280°C whereas no yield point was present in the same material tested at room temperature. (auth)

15681 CRRP-761-A
Atomic Energy of Canada Ltd. Chalk River Project, Chalk River, Ont.
MEASUREMENTS OF THE REACTIVITY CHANGE WITH IRRADIATION FOR NATURAL URANIUM SAMPLES IRRADIATED IN NRX. A. G. Ward and D. S. Craig. May 15, 1959. 54p. (AECL-812). $1.50(AECL).

Experimental measurements and the interpretation of the changes in the reactivity and the constituents of natural uranium occurring in irradiations up to 0.63 n/kilobarn are described. The effect of poisons with a short half-life, such as Xe-135, is not included. A description of the irradiations, the integrated flux measurements, and the measurement of the changes in reactivity is given in this report, part A. In part B Hart et al. describe experimental determinations of the amounts of the plutonium and uranium isotopes present in some of the samples of irradiated uranium. Part C compares calculated changes in reactivity with the experimentally determined values. (auth)

15682 KAPL-M-WAN-9(Rev.)
Knolls Atomic Power Lab., Scenectady, N. Y.
LOSS OF THERMAL CONTROL EFFECTIVENESS OF EUROPIUM AS A RESULT OF EXPOSURE IN S3G. W. A. Northrop and I. A. Podhorez. Mar. 1959. 22p. Contract W-31-109-Eng-52. $4.80(ph), $2.70(mf) OTS.

Calculations were made of the reduction in the cross section of europium as a result of thermal neutron flux exposure. The cross section is related to the number of neutrons absorbed in the chain of five isotopes and these data are used to determine the loss of thermal control effectiveness stainless steel-europium oxide rods. In control rods of typical dimensions, the loss of thermal effectiveness after 3000 hr at 100 Mw is negligible for concentrations of the oxide above 15 vol. %. The loss of control is likely to be slightly greater for program control than for bank control. (auth)

15683 KAPL-M-WAN-10(Rev.)
Knolls Atomic Power Lab., Schenectady, N. Y.
EFFECTS OF BURNUP ON COMPARISON OF HAFNIUM AND EUROPIUM FOR S3G CONTROL RODS. W. A. Northrop and I. A. Podhorez. Mar. 1959. 12p. Contract W-31-109-Eng-52. $3.30(ph), $2.40(mf) OTS.

Recent experimental data have shown that a sizeable proportion of the control effectiveness of europium oxide control rods is due to the absorption of epithermal neutrons. The analysis was extended to include a rough estimate of the effects of resonance absorption on control loss due to burnup. Such an analysis shows that for the chosen reactor (100 megawatts for 3,000 hours) a europium oxide concentration of ~ 28 wt. % in stainless steel is required for end-of-life equivalence with $^3/_{16}$ in. thick hafnium. This estimate is based on 19 europium oxide control rods. Use of 7 hafnium rods and 12 europium oxide rods reduces the required concentration to ~ 26 wt. %. (auth)

15684 NP-7623
Stanford Research Inst., Menlo Park, Calif.
EFFECT OF RADIATION ON THE MECHANICAL PROPERTIES OF PLASTICS. Quarterly Progress Report No. V (Report No. 5) for November 15, 1958 to February 15, 1959. David L. Chamberlain, Jr. Apr. 1, 1959. 21p. SRI Project No. SU-2296. Contract DA-04-200-ORD-698.

Polyethylene reeds were carried through a sequence of irradiation and VIRA measurements from 0 to 66 mrep. Plots of dynamic elastic modulus versus dose are given. (T.R.H.)

15685 NP-7631
Battelle Memorial Inst. Radiation Effects Information Center, Columbus, Ohio.
MONTHLY ACCESSION LIST 24 [ON RADIATION EFFECTS DATA]. June 15, 1959. 26p. Project No. 2133. Contract AF33(616)-6564.

15686 WADC-TR-56-557(Pt.II)
Wright Air Development Center. Materials Lab., Wright-Patterson AFB, Ohio.
EFFECTS OF GAMMA RADIATION ON AIRCRAFT TRANSPARENT MATERIALS. [Period covered] November 1956 to January 1958. Donald L. Schmidt. Mar. 31, 1958. 41p. Project title: RUBBER, PLASTIC AND COMPOSITE MATERIALS. Task title: TRANSPARENT MATERIALS. (AD-155580).

Additional data on gamma radiation-induced changes in commonly-used and experimental transparent plastic materials are presented. Eight materials of an acrylic or polyester type were irradiated to maximum absorbed energy levels of 10^6 to 10^{10} ergs per gram in a cobalt-60 isotope facility. The irradiated materials were then evaluated in accordance with standard testing procedures to determine which physical properties were altered by gamma irradiation, the nature of these changes, and the magnitude of these changes. Results show that most of the plastic materials properties were affected by a high intensity gamma radiation environment. The principal effect was found to be that of degradation, but initial property improvements were also noted. This latter effect, was almost always followed by degradation upon continued irradiation. Comparative radiation stability data are presented on the various irradiated transparent plastic materials. Threshold and 25% damage dosages for the individual materials properties are reported. The optical properties of the materials were more susceptible to gamma radiation than were the mechanical, thermal or permanence-type properties. Threshold dosages were about 1 to 5×10^7 ergs per gram for optical properties that change with irradiation, and about 10^8 to 10^9 ergs per gram for other radio-sensitive properties. (auth)

15687
LOW-TEMPERATURE IRRADIATION OF TRANSITION METALS IN AN ATOMIC REACTOR. Pierre Lucasson. Ann. phys. 4, 435-88(1959) Mar.-Apr. (In French)

Faults in crystalline structure produced in metals by irradiation in a reactor were studied. The construction of a liquid-nitrogen-cooled apparatus for the irradiation of the samples in the EL-2 is described in detail. Measurements of the variation of the electric resistivity during irradiation were made on niobium, molybdenum, palladium, tantalum, tungsten, and platinum. The results show that the electron structure of the irradiated metal has an important effect on the increase in resistivity caused by atomic displacement. The comparison of the melting points of the metals with the rate of the restoration of faults suggests that in metals of the same crystalline structure the restoration processes are identical. The measurements of electrical resistivity made at regular intervals also permitted a study of the control of the reactor. 73 references. (auth)

15688
THE EFFECTS OF RADIATION ON SOLIDS. Yu. N. Sokurskii. Atomnaya Energ. 6, 403-25(1959) Apr. (In Russian)

A review is given of reports presented at the Second International Conference on Peaceful Applications of Nuclear Energy (Geneva, 1958) on the effects of radiation on solids. Analysis is made of experimental work on the quantitative evaluation of the radiation-induced defects in materials and on the neutron radiation effects on fissionable uranium, plutonium, and their alloys. New data are presented on the effects of large burnup (up to 2 at.%) on the dimensions and shape of fabricated uranium and its alloys. Data are also presented on the effects of temperature and radiation dose as well as other parameters on the mechanical properties of steel and other construction materials. Results are given from investigations of radiation effects on the nonmetallic materials BeO, UO_2—BeO, UO_2—ThO_2, graphite, and others. (tr-auth)

15689
THE PROPERTIES OF EXCITATIONS PRODUCED DURING THE TRANSITION OF FAST CHARGED PARTICLES THROUGH A CRYSTAL. Miroslav Trlifaj (Czechoslovak Academy of Sciences, Prague). Czechoslov. J. Phys. 7, 667-73(1957).

The properties of excitons produced during the transition of fast charged particles through crystals are studied theoretically. The basic equations are derived, and the probability of exciton production is considered. The results show that during the production of excitons with negative effective mass the energy exchange between the exciton and the oscillations of the crystal lattice is accomplished by an increase in the wave number of the exciton. The lifetime of the exciton will increase because of the irradiation. This results in a difference between the period of fading of the luminescence conditioned by the radiant annihilation of the exciton produced by charged particles and of the exciton produced by optical excitation. Triplet exciton can also be produced under certain conditions. (J.S.R.)

15690
RADIATION-MATTER INTERACTION. Peyches (Laboratoire des Glaceries de la Manufacture de Saint-Gobain, Chauny et Cirey, France). p.71-83 of "Journées d'Information sur l'Énergie Nucléaire, 14-15-16 Janvier 1957." Documents, Suppl. to No. 114. France, Commissariat General á la Productivité. 1957. 203p. (In French)

A survey is made of the interaction of radiation with matter. The types of radiation are summarized, and nuclear collisions are considered. Ionization by radiation and slowing down of particle radiation are discussed. The displacements of nuclei in solids and the results of the displacements are examined. Chemical reactions can be initiated by various radiations, and these are briefly discussed. (J.S.R.)

15691
EFFECTS OF γ-RAYS ON AQUEOUS SOLUTIONS OF SYNTHETIC POLYMERS. Shintaro Sugai, Mitsuo Ishikawa, and Jiro Furuichi (Hokkaido Univ., Sapporo). J. Phys. Soc. Japan 14, 544-5(1959) Apr.

Observations were made on the effects of γ rays from Co^{60} on aqueous solutions of synthetic polyelectrolyte Na-CMC. According to ultracentrifugal figures of concentrated solutions, Na-CMC seems to be a mixture of two groups, one of which has a larger molecular weight than the other. Decreases of specific viscosity due to irradiation are tabulated. Changes of molecular weights calculated from the intrinsic viscosity and those of ultracentrifugal coefficients are also tabulated. At low temperatures, the conductivity of the irradiated solution is greater. (A.C.)

15692
RADIOSTERILIZATION OF FOOD AND MEDICAL SUPPLIES. Roman Broszkiewicz. Nukleonika 4, 35-46(1959). (In Polish)

The radiosensitivity of microörganisms is discussed, and views are given on the mechanism of protection of microörganisms against radiation by bacterial colonies and certain chemical compounds. Data illustrating the effects of radiation on some chemical compounds occurring in food are given. Problems of the changes produced in food materials by large doses of ionizing radiation and methods of eliminating these changes are discussed. Results of research on induced activity in irradiated compounds are given. (auth)

RADIOACTIVE WASTE

15693 CF-59-3-92(Rev.)(Del.)
General Electric Co. Hanford Atomic Products Operation, Richland, Wash. and Oak Ridge National Lab., Tenn.
ANSWERS TO QUESTIONS ON OFF-GAS TREATMENT. Eurochemic Assistance Program: Comments by HAPO, dated March 12, 1959, on Questions by E. L. Nicholson. L. P. Bupp. Mar. 26, 1959. 7p. \$1.80(ph), \$1.80(mf) OTS.

Information relative to the performance and operation of silver reactors is presented. The information is given as answers to questions submitted in the USAEC-Eurochemic Company coöperative program. The answers to 8 questions are presented along with the basis for comments. (J.R.D.)

15694 ERDL-1451-RR
Engineer Research and Development Labs., Fort Belvoir, Va.
THE REMOVAL OF RADIOACTIVE MATERIAL FROM WATER BY SERIAL COAGULATION, BY ION EX-

CHANGE, AND BY CHARCOAL ABSORPTION (SALTY DOG VII). William J. Lacy, Ronnie R. Rollins, and Lester M. Lawless. June 22, 1956. 24p. Project 8-75-07-214.

Methods of removing radioactive materials from water by serial coagulation, by ion exchange, and by charcoal adsorption were examined. Results indicate that all of the Ru-106—Rh-106, Zr-95—Nb-95, and Ce-144—Pr-144 present may be removed by serial coagulation, also over 98% of Ba-140—La-140, and Sr-90—Y-90 can be removed by this method as well as 87.8% of mixed fission products. The capacity of ion exchange resins such as Amberlite Ir-120 for removing Sr-89 from water is essentially independent of flowrate, column length, temperature, and pH. Granular bone charcoal was tested for radioisotope removal from water. The highest removal was obtained with Ag-110 (89.2%) and Pr-144 (88.8%) while the lowest removal was with Na-24 (38.3%). Pretreatment of contaminated water with dimethylglyoxime was found to be beneficial in charcoal removal of radioisotopes. Using this additive more than 98% of the Sr-89, Ba-140, La-140, Zr-95, Nb-95, Ca-45, Y-91, Ag-110, and Ce-144—Pr-144 present were removed. (J.R.D.)

15695

CONTAMINATION AND DECONTAMINATION TESTS OF A DRAINAGE SYSTEM FOR RADIOACTIVE WASTE WATERS. P. Cohen, G. Pardo, and G. Wormser (Centre d'Études Nucléaires, Saclay, France). Énergie nucléaire 1, 23-6(1959) Jan.—Apr. (In French)

Contamination studies of waste water containing I^{131} were made with a consideration of the effects of the time of contact, the pH of the solution, the dilution of the contaminant liquid, and the form of the evacuation channel. It was concluded that for the most effective decontamination, it was necessary to neutralize the iodic acid effluents. A considerable fraction of the effluent is retained by the walls of the evacuation channel. (J.S.R.)

15696

WATER QUALITY PROBLEMS IN THE COLUMBIA RIVER BASIN. Herbert C. Clare (Public Health Service, Portland, Ore.). Proc. Am. Soc. Civil Engrs. 85, No. SA 3, 1-34(1959) May.

Problems of maintenance of high water quality throughout the Columbia River Basin are discussed. As the economy matures, the preventive pollution control program of the area becomes increasingly important. The public in the Pacific Northwest is anxious that as much waste as possible be kept out of waters of the Columbia Basin. (auth)

15697

RADIOACTIVE CONTAMINANT REMOVAL FROM WASTE WATER: ENGINEERING DESIGN FEATURES. Mark C. Culbreath (Burns and McDonnell Engineering Co., Kansas City, Mo.). Proc. Am. Soc. Civil Engrs. 85, No. SA 3, 41-53(1959) May.

The design and operation of a plant at Oak Ridge National Lab. on the collection, treatment, and disposal of large volume (0.5 to 0.7 mgd), low-level radioactive liquid waste are described. The design of the lime-soda softening process treatment plant for the removal of Sr and the total rare earths from the process waste water is given. (auth)

15698

RADIOACTIVE CONTAMINANT REMOVAL FROM WASTE WATER: EVALUATION OF PERFORMANCE. K. E. Cowser and Roy J. Morton (Oak Ridge National Lab., Tenn.). Proc. Am. Soc. Civil Engrs. 85, No. SA 3, 55-76(1959) May.

The design and operation of a plant at the Oak Ridge National Lab. for the collection, treatment, and disposal of large volume (0.5 to 0.7 mgd), low level radioactive liquid waste is described. The performance of the lime-soda softening process treatment plant for the removal of Sr and other materials is described. (auth)

REACTORS

General

15699 AERE-R/R-2753

United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.

NUCLEAR REACTOR PHYSICS FOR THE HYPERBOLOID REACTOR. D. A. Newmarch. Apr. 1959. 32p. \$0.63(BIS).

A method is derived for evaluating hyperboloid reactors, with skew fuel elements, by means of results obtained for cylindrical reactors. The method is developed by argument from analogy, estimates being made of the uncertainties resulting from the various assumptions. Application of the method to G.C.H.W. type cores shows that the uncertainty due to this method corresponds to approximately 2% in the fissile investment if the core twist does not exceed 90°. (auth)

15700 ANL-5942

Argonne National Lab., Lemont, Ill.

NUCLEAR INSTRUMENTATION AND CONTROL OF THE D_2O-MODERATED THORIA-URANIA CRITICAL ASSEMBLY (ZPR-VII). C. A. Pesce. May 1959. 28p. Contract W-31-109-eng-38. \$1.00(OTS).

The design criteria and operation of seven nuclear instrumentation channels and safety interlocks employed for initial measurements on heavy-water moderated thoria-urania lattices of interest to power reactors are described. The mechanical design features of the various control mechanisms and components are illustrated or described briefly where necessary to clarify the over-all instrument-control scheme. The basic start-up sequence is given. (auth)

15701 APEX-492

General Electric Co. Aircraft Nuclear Propulsion Dept., Cincinnati.

FAST-PERIOD REACTOR SAFETY FUSE TESTS. S. N. Stilwell and R. L. Waterfield. June 1957. 79p. Contracts AF33(600)-38062 and AT(11-1)-171. \$2.25(OTS).

The combination of an effective fuse with a sensitive trigger is investigated. Tests conducted with two types of fuse, the annular-passage and the control-rod-type fuse, are described and analyzed. Appendixes present the methods of analysis and calculation, an analysis of fuse performance, and a summary of alternative fuse trigger and fuse system designs, with methods for adaption of fuses to power reactors. (auth)

15702 BRL-M-1194

Ballistic Research Labs., Aberdeen Proving Ground, Md.

THE ELASTIC-PLASTIC RESPONSE OF THIN SPHERICAL SHELLS TO INTERNAL BLAST LOADING. Wilfred E. Baker. Feb. 1959. 38p. Sponsored by AEC under DA Project No. 503-04-002. \$1.25(OTS).

The results are presented of a second analytical study, supplemented by some experiments, of the response of an idealized nuclear reactor containment shell to internal transient loading which could be caused by reactor runaway. The containment shell is assumed to be a thin spherical shell, and the transient loading is assumed spherically symmetric. The theory of the elastic-plastic response of the shell is developed for a blast loading which is intense enough to cause plastic flow. Solutions are obtained for both a linear model which neglects changes in shell radius and thickness, and a more exact non-linear model which accounts for these effects. Experimental checks of the theories are described. (auth)

15703 CRCE-823
Atomic Energy of Canada Ltd., Chalk River, Ont.
THE INTERNAL INSULATION OF REACTOR PRESSURE TUBES. 2. PERFORMANCE OF FULL-LENGTH STAGNANT WATER LAYERS. R. E. Hollies and D. H. Charlesworth. Feb. 1959. 27p. (AECL-781). $1.00(AECL).

Heat transfer tests on full-length insulators inside reactor pressure tubes show that multiple stagnant water layers can restrict the tube wall temperature to a value close to the mean moderator temperature. Thus, the allowable stress for a Zircaloy pressure tube can be increased significantly or a magnesium alloy can be used as the pressure tube material. In either case a reduction in parasitic neutron capture is obtained. Alternatively, the higher stress can be used to give a higher operating pressure and temperature for the reactor coolant, and hence a higher thermal efficiency. The insulation is composed of layers of stagnant water formed by a spiral of dimpled foil contained in the annulus between a full-length thin inner tube and the pressure tube. With a simulated fuel load on the insulation in a horizontal pressure tube the thermal performance of the test insulator was satisfactory although some dimple distortion occurred. However, these tests were only of several hours duration. The metal-to-metal conduction through the dimples on the foil was found to be small and essentially independent of the number of dimples per unit area. At reactor pressure and temperature conditions, the pressure tube was shown to be free of hot spots. The heat loss from the coolant to the moderator exceeded the value calculated for pure conductive heat transfer through the water layers by twenty per cent. For example, an insulator made up of a 0.100-inch thickness of heavy water subdivided into seven layers by six turns of dimpled foil would transmit 15,600 Btu/(hr)(ft^2) if the inner boundary of the insulation were at 500°F and the outer boundary at 200°F. (auth)

15704 FZK-110
Texas. Agricultural and Mechanical Coll., College Station. Engineering Experiment Station and Convair. Nuclear Lab., Fort Worth, Tex.
HAZARDS SUMMARY REPORT FOR THE NUCLEAR SCIENCE CENTER. Mar. 5, 1959. 122p. $19.80(ph), $6.30(mf) OTS.

A final design and safety analysis of the proposed reactor facility for Texas A and M College is presented in order to substantiate a request for approval to construct and operate said facility. The reactor will be a light-water cooled and moderated, swimming pool research reactor similar in design to, and incorporating the same control system and safety features as, the 3-Mw Ground Shield Test Reactor. The reactor is scheduled for operation up to 5-Mw with modifications to the cooling system. (W.D.M.)

15705 GEAP-3114
General Electric Co. Atomic Power Equipment Dept., San Jose, Calif.
NEUTRON AND GAMMA STREAMING IN VOID CHANNELS. Peter G. Aline. Jan. 31, 1959. 23p. For Atomics International Div., North American Aviation, Inc. Contract N8-S-452. $4.80(ph), $2.70(mf) OTS.

An expression for the neutron or gamma flux which streams from a void channel parallel to the axis of a cylindrical reactor core was obtained. Diffusion theory was used to determine the neutron current into the channel in terms of the channel radius and length, assuming an isotropic flux near the surface of the channel. The final expression for the streaming flux depends only upon the magnitude of the flux at the mid-plane of the channel and the channel dimensions. Evaluations of the final expression for typical cases are presented in curves permitting simple computation of specific problems. For an axial cosine flux distribution the neutron current into the channel is positive over the central 80 percent of its length, becoming negative in the end regions. This effect tends to reduce the magnitude of the streaming flux. The neutron or gamma streaming flux emanating from the channel is characterized by a collimated beam. Its effect on shielding and gamma heating must be investigated in detail for a particular reactor design. The method yields a streaming flux four to eight times smaller than previous methods. (auth)

15706 HW-58208
General Electric Co. Hanford Atomic Products Operation, Richland, Wash.
CHEMICAL DECONTAMINATION FOR TUBE REPLACEMENT. Harry F. Jensen. Nov. 17, 1958. 5p. $1.80(ph), $1.80(mf) OTS.

In a production test at the Hanford Dual Purpose Reactor, it was found that considerable benefits can be obtained by decontamination with Turco 4306-B. The procedures for use in such decontamination are presented, and recommendations for their use as a tool for reduction of contamination effects are made. It is pointed out that sizeable percentages of total personnel exposure occur during tube replacement outages. Equipment and costs are also discussed as well as corrosion by Turco and waste disposal. (J.R.D.)

15707 KAPL-M-WBW-6
Knolls Atomic Power Lab., Schenectady, N. Y.
PPA FLUX TRANSIENT STUDY. PART I. EXPERIMENTAL DATA. W. B. Wright, F. Feiner, and A. D. Musto. Apr. 16, 1959. 99p. Contract W-31-109-Eng-52. $15.30(ph), $5.40(mf) OTS.

Spatial flux transients were introduced into a number of lattices by slabs of cadmium or hydrogenous materials. Detailed activation measurements of these transients are reported. In most cases the transients followed a single exponential with a relaxation length that was dependent upon the nature of the perturbing slab and was, in general, different from the value obtained from SOFOCATE averaging. (auth)

15708 NAA-SR-3222
Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.
USE OF SMALL SOURCE THEORY IN THE DETERMINATION OF THE CRITICAL SIZE OF HETEROGENEOUS THERMAL REACTORS. J. W. Zink. Mar. 15, 1959. 19p. Contract AT-11-1-GEN-8. $0.75(OTS).

The critical equation based on small source theory contains certain parameters which characterize the fuel elements and other parameters which characterize the moderator of a heterogeneous reactor. In addition, the dimensions of the lattice enter into the critical equation. The material buckling of a thermal reactor can be determined from this critical equation once the parameters characterizing the fuel elements and the moderator are known. The parameters which characterize the moderator are the thermal diffusion coefficient, age, and the thermal diffusion length. Methods of measuring these parameters are well known. The parameters which characterize the fuel element are the thermal blackness β, a multiplication factor h, and a third parameter γ, which is related to the epithermal blackness of the fuel element. Methods of determining these parameters are described here for a case involving cylindrical geometry. The parameters are determined for a specific type fuel element, and the bucklings for a series of lattice spacings are compared with bucklings determined by means of an exponential experiment. The bucklings calculated from small source theory, utilizing experimental data from a single fuel element, were different by less than 10% from those measured by means of an exponential experiment over a wide range of lattice spacings. (auth)

15709 NP-7578

Applied Nucleonics Corp., Walnut Creek, Calif.

ANCO 201 NUCLEAR REACTOR. Preliminary Design Study. Nov. 15, 1955. 57p.

The ANCO 201 is a very compact reactor designed to operate at a power level of 100 mw on a university campus or industrial site. The core consists of 450 grams of U^{235} in the form of 20% enriched UO_2 particles imbedded in radiation-stabilized polyethylene moderator. Shielding of graphite, boron, lead, and water surrounds the core. The maximum thermal neutron flux of 6×10^6 neutrons cm^{-2} sec^{-1} is sufficient to make this reactor a unique and valuable tool for training, research, and industrial process control. Analysis indicates the ANCO 201 to be sufficiently stable and accident proof to allow installation in existing buildings in highly populated areas. The reactor and control unit is mobile, stands $8\frac{1}{2}$ feet high and is $6\frac{1}{2}$ feet in diameter. (auth)

15710 NP-7597

Washington. Univ., Seattle. Engineering Experiment Station.

A NATURAL URANIUM—GRAPHITE SUBCRITICAL REACTOR SYSTEM FOR EDUCATION AND RESEARCH. Report No. 7. PART I. DESCRIPTION AND EXPERIMENTAL MEASUREMENTS. A. L. Babb, L. Grimsrud, and W. E. Wilson. PART II. IBM 650 COMPUTER PROGRAMS FOR EFFECTIVE SIZE, DIFFUSION LENGTH, AND MATERIAL BUCKLING CALCULATIONS. A. L. Babb, L. Grimsrud, and S. Tashiro. 1959. 34p.

Critical measurements were performed on an exponential pile. Routines for the IBM-650 computer were developed for the calculation of the effective size from horizontal neutron flux traverses, and the diffusion length and the material buckling from the best fit to axial traverses for a parallelopiped subcritical reactor. The programs were checked with data obtained from the natural uranium—graphite subcritical reactor. (W.L.H.)

15711 NP-7607

Wright Air Development Center. Air Force Nuclear Engineering Test Facility, Wright-Patterson AFB, Ohio.

AIR FORCE NUCLEAR ENGINEERING TEST FACILITY. WRIGHT AIR DEVELOPMENT CENTER, AIR RESEARCH AND DEVELOPMENT COMMAND. Kent P. Howard. Apr. 1959. 45p.

The Air Force Nuclear Engineering Test Facility is described as to design, purpose, and present state of development. The facility will enable the development of components and systems which must operate in the combined environments of nuclear radiation and high-speed, high-altitude flight. The major features of the facility are a 10-Mw ORR-type reactor with two adjacent 330 ft^3 environmental irradiation cells, a remote operated irradiated materials handling system a multiple hot cell complex, a waste processing plant, and a low-level laboratory building. (A.C.)

15712 ORNL-2722

Oak Ridge National Lab., Tenn.

NUCLEATE-BOILING STUDIES WITH AQUEOUS ThO_2 SLURRIES. D. G. Thomas, L. D. Felten, and R. M. Summers. June 23, 1959. 24p. Contract W-7405-eng-26. $0.75(OTS).

Nucleate-boiling heat-transfer measurements were made with aqueous thorium oxide slurries containing up to about 1000 g of Th per kg of H_2O (0.105 volume fraction of solids, 1- to 3-μ average diameter). Boiling took place from the surface of $\frac{1}{16}$- and $\frac{1}{8}$-in.-diam. platinum tubes submerged in slurry. The results may be represented in terms of the equation $q/A = K(\Delta T)^n$, where q/A = heat flux, Btu/(hr) (ft^2), K = dimensional constant, ΔT = temperature difference between heated tube wall and bulk slurry temperature, °F. For the slurries studied, the heat flux at a ΔT of 10°F was about 10^4 Btu/(hr)(ft^2) regardless of slurry concentration. However, the value of the exponent, n, decreased as the volume fraction of solids was increased. The value of n was 3.3 with no thorium oxide present and approached unity at a volume fraction of solids of 0.10. The maximum heat flux attainable under nucleate-boiling conditions (often called the critical heat flux or burnout heat flux) at slurry concentrations of 200 g of Th per kg of H_2O was about the same as for water. However, at a concentration of 1000 g of Th per kg of H_2O, the burnout heat flux was 210,000 Btu/(hr)(ft^2), compared with a value of 490,000 Btu/(hr)(ft^2) for water under corresponding conditions. At constant heat flux, the temperature difference between the heated tube surface and the fluid saturation temperature increased 5 to 6°F per hour. This result might be explained by a "soft" film that surrounded the heated metal surface. This film was apparently less than $\frac{1}{32}$ in. thick and was never distinguishable as an adhering film after the tube was removed from the slurry system. No hard cakes were observed on the surface from which boiling took place during any of the tests. The nucleate-boiling tests were made with aqueous thorium oxide slurries which had non-Newtonian laminar flow characteristics and which were almost Newtonian under turbulent flow conditions. No phenomena were observed which could be attributed to the effect of the solid particles on the gross physical properties of the slurry; for example, the non-Newtonian laminar flow characteristics of the slurry had no discernible effect on the nucleate-boiling heat transfer. (auth)

15713

REACTOR FUEL LIFE—THE REACTIVITY LIMITS. P. J. Grant (General Electric Co., [Ltd., Erith, Kent, Eng.]). Atomic World 10, 132-5(1959) Apr.

The life limit of reactor fuel is discussed, and optimum fuel cycling by ensuring that each element is fully burned is considered. Data are given on point reactivity as well as flux distortions in reactors which have lost considerable reactivity, and axial and radial flux distributions in large gas cooled reactors. (J.R.D.)

15714

REACTOR FUEL LIFE—THE METALLURGICAL LIMITS. M. D. Jepson (United Kingdom Atomic Energy Authority, [Springfields, Lancs, Eng.]). Atomic World 10, 136-9(1959) Apr.

The metallurgical effects of neutron bombardment and the fission of U is reviewed. It is pointed out that neutron bombardment damages all metals, but such effects are small compared with those produced in a nuclear fuel such as U. Thermal cycling occurs because of fission released energy, which changes the crystals dimensionally, giving rise to wrinkling and changes in creep strength. In addition, noble gases are produced in fission, causing the metal to swell. An analysis of these and other effects are presented. (J.R.D.)

15715

THE DRAGON H.T.G.R. PROJECT. A PRELIMINARY DESIGN STUDY. Atomic World 10, 178-9; 185(1959) May.

Design studies are being made on a high temperature gas-cooled reactor (The Dragon H.T.G.R. Project). This research reactor will be used to investigate the problems of high temperature gas-cooled reactors. Preliminary designs for a 10 Mw reactor have been made at Harwell. A general arrangement of the reactor is shown in drawings. The basic principles of the final design are discussed. (A.C.)

15716

THE FRENCH EL-3 REACTOR. J. Robert and V. Raievski (Commissariat à l'Énergie Atomique, Paris) and J. Hainzelin (Chantiers de l'Atlantique Penhoët-Loire, Paris). Atomic World 10, 180-3 (1959) May.

A high flux research reactor equipped with numerous experimental devices has been built at the Saclay nuclear center. It is a heterogeneous, enriched uranium reactor using heavy water as moderator and coolant. Details of the reactor and the facilities it provides are discussed. (A.C.)

15717

SOME PROCEDURES FOR THE EVALUATION OF REACTOR FUELS AND SHEATHING MATERIALS AT CHALK RIVER. R. F. S. Robertson (Atomic Energy of Canada Ltd., Chalk River, Ont.). Can. J. Chem. Eng. 36, 213-16(1958) Oct.

The fuel development program at Chalk River is discussed with special reference to the testing of uranium oxide reactor fuels in loops inserted in the NRX reactor. In these loops water may be recirculated over the test elements at temperatures up to 550°F and pressures up to 2000 psi. The characteristics of a loop are described and the results of various tests are briefly discussed. The testing of sheathing materials such as Zircaloy-2 and aluminum-nickel alloys is also described. (auth)

15718

UTILIZATION OF LIQUID METALS IN NUCLEAR REACTORS. André Ertaud. p.85-96 of "Journées d'Information sur l'Energie Nucléaire, 14-15-16 Janvier 1957." Documents, Suppl. to No. 114. France, Commissariat General á la Productivité. 1957. 203p. (In French)

The characteristic properties of liquid metals are briefly reviewed, and the problems posed by their utilization in reactors are considered. The types of reactors using liquid metals and their characteristics and structure are examined, with emphasis on the Sodium Graphite Reactor. Thermal reactors with liquid sodium coolant and beryllium moderator, fast breeder reactors, and liquid metal fuel reactors are also discussed. (J.S.R.)

15719

ENRICHED URANIUM FUEL RODS. Robert Gibrat. p.29-39 of "Journees d'Information sur l'Énergie Nucléaire, 14-15-16 Janvier 1957." Documents, Suppl. to No. 114. France, Commissariat General a la Productivite. 1957. 203p. (In French)

The enrichment of reactor fuel in U^{235} is examined from an economic and a technological viewpoint and as a function of the purpose of the reactor. The selection of the constituents of a reactor, structure of a fuel element, limitations and inconveniencies of natural uranium, utilization of enriched uranium, and selection of the degree of enrichment according to the reactor type are considered. (J.S.R.)

15720

RESEARCH AND MATERIALS TESTING REACTORS. Hubert de Laboulaye (Commissariat à l'Énergie Atomique, Paris). p.41-57 of "Journees d'Information sur l'Energie Nucléaire, 14-15-16 Janiver 1957." Documents, Suppl. to No. 114. France Commissariat General á la Productivite. 1957. 203p. (In French)

Research reactors have tended to have a certain specialization of function, such as training students in the operation of a reactor, production of radioisotopes, experiments on basic neutronics, measurement of the neutronic qualities of reactor materials, study of shielding, and materials testing. The swimming pool reactor is discussed as an example of a reactor built to study shielding. Materials testing reactors are discussed in detail and several examples are given. The characteristics of a materials testing reactor are described. (J.S.R.)

15721

ON THE KINETICS OF THE SPERT-I REACTOR. A. Ascari (Sorin, Milan). Energia nucleare (Milan) 6, 259-66(1959) Apr.

A model proposed by Horning for the transients of the SPERT-I reactor (ERL-110) is simplified by means of an empirical coupling between reactor power and fuel temperature. The resulting second order kinetic differential system is studied by topological methods, yielding, for both the step and ramp reactivity inputs, qualitative results in satisfactory agreement with experience: a power overshoot followed by damped oscillations in the step case, asymptotically divergent oscillations in the ramp case. (auth)

15722

DEVELOPMENTS IN PHYSICS. J. V. Dunworth (Atomic Energy Research Establishment, Harwell, Berks, Eng.). J. Brit. Nuclear Energy Conf. 4, 85-96(1959) Apr.

General impressions are given on the physics aspects of reactors which the second Geneva conference showed to be of increasing importance. Comments on the physics of selected reactor systems and on research reactors are included. (T.R.H.)

15723

DEVELOPMENTS IN REACTOR TECHNOLOGY.

H. Kronberger (United Kingdom Atomic Energy Authority, Risley, Lancs, Eng.). J. Brit. Nuclear Energy Conf. 4, 107-14(1959) Apr.

Advances made in fuel elements, graphite, Be, liquid coolants, moderators, heat transfer, and instrumentation since the first Geneva conference are discussed. (T.R.H.)

15724

METALLURGICAL DEVELOPMENTS. H. M. Finniston (C. A. Parsons & Co., Ltd., Newcastle upon Tyne, Eng.). J. Brit. Nuclear Energy Conf. 4, 115-30(1959) Apr.

Metallurgical developments reported in the second Geneva conference are discussed. The topics include U, Th, Pu, Zr, graphite, Al, Mg, Be, Nb, UO_2, UC, ceramics, fuel elements, radiation effects on non-fissionable material, and liquid metal fuels. (T.R.H.)

15725

ON THE TERMINATION OF REACTOR EXCURSIONS. John MacPhee (AMF Atomics, Greenwich, Conn.). Nuclear Sci. and Eng. 5, 273-84(1959) May.

The response of a reactor to step changes in δk is reviewed for two cases; small positive changes in δk, and changes in δk greater than β. Analytical expressions are derived which give the negative change in δk required to terminate each type of excursion. Expressions for obtaining power overshoot are also obtained for each case for various types of δk removal. The analytical results are confirmed by more exact calculations with an analog and a digital computer. It is shown that to terminate an excursion produced by a change in $\delta k < \beta$, it is only necessary to reduce δk at a rate such that zero δk is reached in about $2\frac{1}{2}$ sec. The face that, to terminate a super-prompt-critical excursion, it is only necessary to reduce δk to a value equal to approximately β, is demonstrated analytically. (auth)

15726

REDUCED DELAYED NEUTRON GROUP REPRESENTATIONS. R. E. Skinner and E. R. Cohen (Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.). Nuclear Sci. and Eng. 5, 291-8(1959) May.

It has been shown that a two-delayed neutron group model will accurately represent the asymptotic behavior of the reactor transfer function. Correspondingly, the requirement that this asymptotic behavior be accurately represented is sufficient to specify completely the two-delayed neutron group constants. Further, a three-delayed neutron group model has been evolved which is designed to represent both the asymptotic behavior of the transfer function and shutdown behavior. The inhour equation, transfer function, and transient behavior for step inputs of reactivity with and without reactivity feedback loops for the two- and three-delayed neutron group representations are compared with those given by the standard one group and many delayed neutron group treatments. Important consequences of such reduced group representations are savings in machine time in making kinetic studies and increased tractability of the reactor kinetic equations. (auth)

15727

THERMAL ACTIVATION SHAPES IN A WATER-MODERATED CRITICAL ASSEMBLY. M. Goldsmith and T. M. Ryan (Westinghouse Electric Corp., Pittsburgh). Nuclear Sci. and Eng. 5, 299-305(1959) May.

A method of computing thermal activation shapes in critical assemblies is formulated and compared with experiment. Corrections are made for local variations of the flux and for inadequacies of diffusion theory. For the assemblies studied, these corrections range between 4 and 10 per cent of the calculated thermal activation; a more important change of approximately 20 per cent is introduced by taking account of the core and reflector thermal spectra. (auth)

15728

DETERMINATION OF REACTOR KINETIC PARAMETERS BY PILE NOISE ANALYSIS. Charles Erwin Cohn (Argonne National Lab., Lemont, Ill.). Nuclear Sci. and Eng. 5, 331-5(1959) May.

An experimental investigation was made of the statistical fluctuations in neutron intensity which occur in a nuclear reactor. An ion chamber was exposed to reactor flux, and the fluctuations in its output current were analyzed in a tunable bandpass filter to get the frequency spectrum of these fluctuations, which has the shape of the square modulus of the transfer function. Results are presented of some measurements made on various low-power experimental reactors at Argonne National Laboratory. For reactors with prompt neutron lifetime between 15 and 70 μsec, the quantity l/β was determined within 5 per cent or better from a least squares fit to the transfer function thus measured. (auth)

15729

THE THERMAL NEUTRON SPECTRUM IN A HETEROGENEOUS REACTOR. Hiroshi Takahashi (Japan Atomic Energy Research Inst., Tokyo). Nuclear Sci. and Eng. 5, 338-46(1959) May.

The thermal neutron energy spectrum in a homogeneous medium has been studied by many authors. In case of heterogeneous reactors, the absorption in fuels is so strong that the thermal neutron energy spectrum in the fuel will have a higher energy than in the moderator. The different temperatures of these media will also cause a difference of spectra. The thermal neutron energy spectra of each medium in a heterogeneous reactor are studied. The thermal neutron energy spectrum and the neutron temperature in light-water moderated and UO_2 fueled reactors were calculated by a numerical method and the approximate Wigner-Wilkins method. (auth)

15730

NUCLEATE BOILING CHARACTERISTICS OF ORGANIC REACTOR COOLANTS. D. P. Jordan and G. Leppert (Stanford Univ., Calif.). Nuclear Sci. and Eng. 5, 349-59(1959) June.

Experimental measurements are reported for nucleate boiling of various saturated liquid polyphenyls which are of interest as nuclear reactor coolants. Heat flux is presented as a function of the difference between the heater surface temperature and saturation temperature, and correlations by various semitheoretical methods are discussed. A peak heat flux is reported for all but one of the liquids tested, and good agreement is found with previous work with similar fluids. Methods are suggested which may be used to estimate the nucleate boiling characteristics of these liquids during forced convection at elevated pressures and liquid subcooling, even though the present tests include only pool boiling studies. These methods may be used in feasibility analyses of boiling-polyphenyl cooled and moderated reactors. (auth)

15731

A MONTE CARLO METHOD FOR CRITICALITY PROBLEMS. W. Goad and R. Johnston (Los Alamos Scientific Lab., N. Mex.). Nuclear Sci. and Eng. 5, 371-5(1959) June.

An efficient Monte Carlo method is described for computing the fundamental eigenvalue of the homogeneous transport equation. Importance sampling is used and, in effect, one neutron is followed through a large number of collisions. (auth)

15732

ANALYSIS OF REACTOR OSCILLATIONS FOR COEFFICIENTS OF REACTIVITY. H. Dean Brown and William E. Loewe (E. I. du Pont de Nemours and Co., Aiken, S. C.). Nuclear Sci. and Eng. 5, 376-81(1959) June.

Temperature coefficients in large reactors can be obtained from the transient response of the flux to oscillations of control rods. A method is described with which the coefficients can be measured under full operating conditions and without special instrumentation or access to the pile. Thus, the technique is particularly useful in measuring the dependence of the coefficients upon hydraulic conditions, power level, and fuel exposure. The waveform of the perturbing oscillation of reactivity is trapezoidal so that the regular reactor control system can be used. In large reactors the flux shape changes during the portion of the cycle when the control rods are moving, but only the magnitude of the flux changes significantly while the control rods are stationary. The flux response during this latter portion of the cycle is analyzed for the temperature coefficients. The pile kinetics equations, coupled with equations for the temperatures of fuel, coolant, and moderator, are solved for the flux during the imposed oscillation. The temperature coefficients and their delay times are found by fitting computed fluxes to the observed flux. (auth)

15733

THE USE OF THERMALLY BLACK CONTROL SHEETS. R. J. McWhorter, John Russell, and Bertram Wolfe (General Electric Co., San Jose, Calif.). Nuclear Sci. and Eng. 5, 382-9(1959) June.

The use of thermally black control sheets in a reactor is examined for three special cases: a finite slab reactor with a control sheet at its midplane, an infinite slab reactor containing an array of uniformly spaced control sheets, and a finite slab reactor with two control sheets placed symmetrically about the reactor centerline. The critical equation is obtained in each case and the physical significance of the solutions is examined by allowing the critical parameters to take limiting values. The conclusions reached are: (1) For $\tau/L^2 \ll 1$, thermally black control sheets are effectively black to all neutrons and divide the reactor into independent parts provided the distance W between control sheets, or core boundary and control sheet, is $\gg \tau^{3/2}/L^2$. For $W \lesssim \tau^{3/2}/L^2$, the control sheet is less effective. (2) For $\tau/L^2 \gg 1$ and $W \gg \tau/L$, thermally black control sheets effectively divide the reactor into independent parts. For $W \lesssim \tau/L$, the control sheets are less effective. (3) For $\tau/L^2 \gg 1$, $W/L \gg 1$, and $W^2/\tau \sim 1$, a thermally black control sheet is relatively ineffective as compared with a sheet black to all neutrons. (4) The criteria for placing a given number of sheets most effectively in a reactor depend upon the worth of the sheets as determined from the conditions above. Thus, for sheets which are essentially black to all neutrons, the position of maximum effectiveness occurs when the reactor is cut into pieces of nearly equal size. However, for sheets of less worth, the positions of maximum effectiveness occur closer to the center of the reactor. In the limiting case, where the control effectiveness is very much smaller than the leakage from the reactor, the sheets should be placed about the reactor center, separated by about one diffusion length. It is pointed out that a very weak thermally black control element in a very large reactor may produce a large effect on the power distribution. (auth)

15734

TRANSFER FUNCTIONS OF DISTRIBUTED PARAMETER NUCLEAR REACTOR SYSTEMS. Elias P. Gyftopoulos and Henry B. Smets (Massachusetts Inst. of Tech., Cambridge). Nuclear Sci. and Eng. 5, 405-14 (1959) June.

Transfer functions of nuclear reactors and counterflow heat exchangers are derived from the partial differential equations with respect to time and spatial coordinates describing the transient behavior of nuclear power plants. These transfer functions can be approximated by lumped electrical networks and pure delays for analog computer studies. The procedure of approximation is illustrated by specific examples. (auth)

15735

NEUTRON SPECTRA IN HETEROGENEOUS PLATE REACTORS. W. Häfele (Kernreaktor Bau- und Betriebs-G.m.b.H., Karlsruhe, Germany). Nukleonik 1, 197-208(1959) June. (In Germany)

In connection with the works of K. Meetz (Z. Naturforsch. 12a 698(1957)) and 1958 Geneva Conference. Paper P/968) on the exact treatment of heterogeneous plate reactors, the flux patterns during slowing down processes were described as a function of the lethargy (logarithm of the energy) by analytical and numerical methods. From a general formulation of the problem, which was not limited to the slowing down part of the spectrum, it was established that the possibility, known from the theory of homogeneous reactors without a reflector, of a product addition in position and energy is only possible in the vicinity of the uranium plates; in general the problem is not separable. The slowing down spectrum was given first for the model case of a constant energy-dependent uranium absorption cross section pattern. Then the case when the absorption cross section in uranium follows a power law in E was treated exactly. It is shown that the slowing down spectrum in the vicinity of the plates at energies which are small enough, in order to permit a detectable absorption in the case of a 1/v law, depends little on the cross section of the moderator and that $\sqrt{\xi}$ instead of ξ (ξ = mean logarithm of the energy loss per collision) enters into the results. The energy dependence of the Fourier components of the flux pattern is treated numerically. (tr-auth)

15736

FAST FISSION FACTOR AND COLLISION PROBABILITY IN MODERATOR FILLED URANIUM TUBES (CALCULATED BY STATISTICAL METHODS). Herbert Rief (Kernreaktor Bau- und Betriebs-G.m.b.H., Karlsruhe, Ger.). Nukleonik 1, 208-15(1959) June. (In German)

From a knowledge of the mean collision probability for moderator filled fuel elements general formulas for the calculation of the fast fission factor were derived. The collision probabilities were determined for cylindrical D_2O-filled uranium tubes by the Monte Carlo method. (tr-auth)

15737

ON THE STATISTICAL THEORY OF NEUTRON TRANSPORT. G. Kosály (Central Research Inst. for Physics, Budapest). Nukleonik 1, 221-4(1959) June.

The behavior of a stable particle in a non-multiplying medium is studied. Considering the fact that certain parameters characterizing the state of the particle are probability variables representing a stochastic process of the Markoffian type, the second Kolmogoroff-Feller equation is derived and found to be equal to the known kinetic equation. As an additional variable, the number of collisions is also introduced into this equation and the space dependence of the macroscopic cross sections is taken into account. After treating the special case of a steady state, the behavior of neutrons in the slowing down region is considered. As an application the probability $pN(u,\mu)dud\mu$ that the neutron lethargy will be changed in the course of N collisions by a value lying in the interval $(u,u + du)$ and that the cosine of the angle between the initial and final direction of the flight of neutrons lies in the interval $(\mu,\mu + d\mu)$ is derived. Upon integrating with respect to the lethargy, the density function of the probability variable μ can be determined. The mean value and the mean square deviation of μ are also derived. (auth)

15738

THE EFFECT OF EFFECTIVE FRACTIONS OF DELAYED NEUTRONS ON THE SHORT TIME BEHAVIOR OF REACTORS. D. Emendörfer and A. Kirchenmayer (Technischen Hochschule, Stuttgart). Nukleonik 1, 233-6(1959) June. (In German)

The effective fractions of delayed neutrons $\beta_{i_{eff}}$ were calculated for a light water reactor. They are, according to the group, approximately 14 to 17% larger than the usual fractions β_i. The effect of this variation on the transition functions and the frequency curve was represented. It is shown that the modifications of the transition functions and the frequency curve are limited excessively only through the variation in the total fractions of delayed neutrons β_{eff} and β, not through the variation in $\beta_{i_{eff}}/\beta_{eff}$ and β_i/β. The latter differences are affected in the transition functions only over approximately 10 times the initial power and lead to deviations of less than 0.5% in the real and imaginary parts of the reciprocal frequency curve. (tr-auth)

15739

REACTOR CORE MATERIALS. Technical Progress Reviews, Vol. 2, No. 2. Columbus, Ohio, Battelle Memorial Institute, 1959. 60p. $0.55(GPO).

Constants of alpha uranium single crystals were determined. Elastic parameters derived from data obtained in this experiment are presented, as well as dilation data for the 100 and 001 directions. Tests on irradiated U were conducted at Hanford, data on mechanical properties are included. Also radiation effects data on U–Zr alloys are given. Results of development work involving gamma phase alloys such as U–Nb, U–Mo and various complex alloys emerging from pyrometallurgical reprocessing of irradiated U are discussed. Also developments in dilute U alloys such as Al–U, U–Zr, and Nb–U are reviewed. Data on resistivity and thermal conductivity of Pu metal are included as well as corrosion data for Pu alloys in air. Progress in Th technology dealing mainly with physical properties, metallography and radiation effects is reported. Reports on dispersion fuel materials such as stainless steel–UO_2, UN, U_3Si_2 in various materials are reviewed, and refractory fuel and fertile materials such as UO_2-containing ceramics fabrication are discussed. Studies of the fabrication of uranium carbides and mixtures of carbides with other compounds are continuing as well as investigations of the properties of several non-UO_2 refractory fuel materials. UO_2 corrosion by CO is discussed in addition to the corrosion behavior of U–Zr alloys in water. A review of basic studies on radiation effects in ceramic and metallic fuels is given. Results of graphite moderator material studies is reported, as well as metallurgical properties of electron bombardment melted Be and Be alloys. Data on the properties of various solid hydrides are presented graphically. Data on corrosion and oxidation kinetics of selected high-temperature alloys are given along with a review of developmental work on Zr, Al, and Mg-base alloy corrosion. Other materials being investigated for corrosion prevention by cladding are Nb, Ta, and Mo. Data on corrosion of various resistant metals and alloys by fused salts are listed. Radiation effects on such materials as Nb, Cu, Ni, and various alloys are presented tabularly. Diffusion studies on U–Ni–Al, U–Zr, and U–Zr–Al systems are discussed; data are included. Properties of cladding and structural materials are listed tabularly and various mechanical properties are represented graphically. Reviews of special fabrication techniques for reactor materials such as, melting, casting, heat-treatment, and hot working are presented. Cladding by roll, pressure, and diffusion bonding are discussed and data on bond strength as affected by bonding conditions are presented as well as results of defection water logging tests. Corrosion data on diffusion bonded fuel elements are included. U fuel element coextrusion with various coatings is reported. Progress in canning techniques involving such materials as Al alloys, Zircaloy-2, Inconel X, and 316 stainless are discussed as well as non-electrolytic chemical-plating, and some information on ceramic coatings. Welding and brazing are discussed, and developments in non-destructive testing such as the ultrasonic fluoroscope, a transistorized metals identification meter, and a remote viewing, high magnification television application for small parts are reported. (J.R.D)

15740

DEVICE FOR TREATING MATERIALS. L. A. Ohlinger, F. Seitz, and G. J. Young (to U. S. Atomic Energy Commission). U. S. Patent 2,874,107. Feb. 17, 1959.

Test-hole construction in a reactor to facilitate inserting and removing test specimens from the reactor for irradiation therein is discussed. An elongated chamber extends from the outer face of the reactor shield into the reactor. A shield box, having an open end, is sealed to the outer face of the reactor shield by its open end surrounding the outer end of the chamber. A removable door is provided in the side wall of the shield box for insertion and removal of test specimens. A means operable from the exterior of the shield box is provided for transferring test specimens between the shield box and the irradiation position within the chamber and consists of an elongated rod having a specimen tray engaging member on its inner end, which may be manipulated by the operator.

15741

TEST-HOLE CONSTRUCTION FOR A NEUTRONIC

REACTOR. L. A. Ohlinger, F. Seitz, and G. J. Young (to U. S. Atomic Energy Commission). U. S. Patent 2,874,108. Feb. 17, 1959.

Test-hole construction is described for a reactor which provides safe and ready access to the neutron flux region for specimen materials which are to be irradiated therein. An elongated tubular thimble adapted to be inserted in the access hole through the wall of the reactor is constructed of aluminum and is provided with a plurality of holes parallel to the axis of the thimble for conveying the test specimens into position for irradiation, and a conduit for the circulation of coolant. A laminated shield formed of alternate layers of steel and pressed wood fiber is disposed lengthwise of the thimble near the outer end thereof.

15742

MEANS FOR TERMINATING NUCLEAR REACTIONS. C. M. Cooper (to U. S. Atomic Energy Commission). U. S. Patent 2,874,109. Feb. 17, 1959.

An apparatus is presented for use in a reactor of the heterogeneous, fluid cooled type for the purpose of quickly terminating the reaction, the coolant being circulated through coolant tubes extending through the reactor core. Several of the tubes in the critical region are connected through valves to a tank containing a poisoning fluid having a high neutron capture cross-section and to a reservoir. When it is desired to quickly terminate the reaction, the valves are operated to permit the flow of the poisoning fluid through these particular tubes and into the reservoir while normal coolant is being circulated through the remaining tubes. The apparatus is designed to prevent contamination of the primary coolant by the poisoning fluid.

15743

REACTOR SHIELD. E. P. Wigner, L. E. Ohlinger, G. J. Young, and A. M. Weinberg (to U. S. Atomic Energy Commission). U. S. Patent 2,874,307. Feb. 17, 1959.

Radiation shield construction is described for a nuclear reactor. The shield is comprised of a plurality of steel plates arranged in parallel spaced relationship within a peripheral shell. Reactor coolant inlet tubes extend at right angles through the plates and baffles are arranged between the plates at right angles thereto and extend between the tubes to create a series of zig-zag channels between the plates for the circulation of coolant fluid through the shield. The shield may be divided into two main sections; an inner section adjacent the reactor container and an outer section spaced therefrom. Coolant through the first section may be circulated at a faster rate than coolant circulated through the outer section since the area closest to the reactor container is at a higher temperature and is more radioactive. The two sections may have separate cooling systems to prevent the coolant in the outer section from mixing with the more contaminated coolant in the inner section.

15744

METHOD AND APPARATUS FOR HANDLING RADIOACTIVE PRODUCTS. D. Nicoll (to U. S. Atomic Energy Commission). U. S. Patent 2,875,345. Feb. 24, 1959.

A device is described for handling fuel elements being discharged from a nuclear reactor. The device is adapted to be disposed beneath a reactor within the storage canal for spent fuel elements. The device is comprised essentially of a cylinder pivotally mounted to a base for rotational motion between a vertical position, where the mouth of the cylinder is in the top portion of the container for receiving a fuel element discharged from a reactor into the cylinder, and a horizontal position where the mouth of the cylinder is remote from the top portion of the container and the fuel element is discharged from the cylinder into the storage canal. The device is operated by hydraulic pressure means and is provided with a means to prevent contaminated primary liquid coolant in the reactor system from entering the storage canal with the spent fuel element.

15745

OVERALL OPTICAL VIEWER. George S. Monk (to U. S. Atomic Energy Commission). U. S. Patent 2,875,346. Feb. 24, 1959.

An apparatus is described for viewing through a tube any desired internal portion of a reactor. A convex head mounted with a plurality of negative lenses with their axes substantially intersecting is fixed in the tube nearest the portion to be viewed. The interior of the tube is filled with a liquid transparent to light and opaque to neutrons and gamma rays. The lense may be made from polymerized methyl methacrylate and aqueous zinc chloride is a suitable transparent liquid.

15746

BRAKE DEVICE. Thomas J. O'Donnell (to U. S. Atomic Energy Commission). U. S. Patent 2,876,867. Mar. 10, 1959.

A brake device is described for utilization in connection with a control rod. The device comprises a pair of parallelogram link mechanisms, a control rod moveable rectilinearly therebetween in opposite directions, and shoes resiliently supported by the mechanism for frictional engagement with the control rod.

15747

SUPPORT DEVICE FOR USE IN A NUCLEAR REACTOR. F. G. Greenhalgh and E. Long (to U. S. Atomic Energy Commission). U. S. Patent 2,877,170. Mar. 10, 1959.

A shock absorbing support device for fuel elements in a nuclear reactor is described. The device is adapted to support a column of moderator material on a lower support plate of a reactor structure and to axially locate the column of moderator with respect to the coolant fluid entry port in the support plate. Located centrally of the device is a vertically extending shaft member telescopingly engaged at its lower end with a tubular member and connected to the tubular member by a shear pin. Below the shear pin embedded in the end of the shaft member are blade members which are adapted to cut into the side of the tubular member in the event the shear pin is destroyed by the impact of a falling fuel element. The cutting action of the blades in the tube absorbs the shock of the fallen element.

15748

MEANS FOR SHIELDING REACTORS. W. M. Garrison, L. T. McClinton, and M. Burton (to U. S. Atomic Energy Commission). U. S. Patent 2,877,171. Mar. 10, 1959.

A reactor of the heterogeneous, heavy water moderated type is described. The reactor is comprised of a plurality of vertically disposed fuel element tubes extending through a tank of heavy water moderator and adapted to accommodate a flow of coolant water in contact with the fuel elements. A tank containing outgoing coolant water is disposed above the core to function as a radiation shield. Unsaturated liquid hydrocarbon is floated on top of the water in the shield tank to reduce to a minimum the possibility of the occurrence of explosive gaseous mixtures resulting from the neutron bombardment of the water in the shield tank.

15749

MOLDED SEALING ELEMENT. B. W. Bradford and W. J. Skinner (to U. S. Atomic Energy Commission). U. S. Patent 2,879,247. Mar. 24, 1959.

Molded sealing elements suitable for use under conditions involving exposure to uranium hexafluoride vapor are described. Such sealing elements are made by subjecting graphitic carbons to a preliminary treatment with uranium hexafluoride vapor, and then incorporating polytetrafluorethylene in them. The resulting composition has good wear resistant and frictional properties and is resistant to disintegration by uranium hexafluoride over long periods of exposure.

15750

CONTROL FOR NEUTRONIC REACTOR. H. V. Lichtenberger and R. A. Cameron (to U. S. Atomic Energy Commission). U. S. Patent 2,880,155. Mar. 31, 1959.

A control rod operating device in a nuclear reactor of the type in which the control rod is gradually withdrawn from the reactor to a position desired during stable operation is described. The apparatus is comprised essentially of a stop member movable in the direction of withdrawal of the control rod, a follower on the control rod engageable with the stop and means urging the follower against the stop in the direction of withdrawal. A means responsive to disengagement of the follower from the stop is provided for actuating the control rod to return to the reactor shut-down position.

15751

CUTTING AND WEDGING JACKET REMOVER. Melvin Freedman and S. Raynor (to U. S. Atomic Energy Commission). U. S. Patent 2,880,636. Apr. 7, 1959.

A tool is presented for stripping cladded jackets from fissionable fuel elements. The tool is a tube which fits closely around the jacket and which has two cutting edges at opposite sides of one end. These cutting edges are adjusted to penetrate only the jacket so that by moving the edges downward the jacket is cut into two pieces.

15752

COAXIAL CONTROL ROD DRIVE MECHANISM FOR NEUTRONIC REACTORS. R. J. Fox and L. C. Oakes (to U. S. Atomic Energy Commission). U. S. Patent 2,881,619. Apr. 14, 1959.

A drive mechanism is presented for the control rod of a nuclear reactor. In this device the control rod is coupled to a drive shaft which extends coaxially through the rotor of an electric motor for relative rotation with respect thereto. A gear reduction mechanism is coupled between the rotor and the drive shaft to convert the rotary motion of the motor into linear motion of the shaft with a comparatively great reduction in speed, thereby providing relatively slow linear movement of the shaft and control rod for control purposes.

15753

IMPROVEMENTS IN OR RELATING TO NUCLEAR REACTORS. Robert Spence (to United Kingdom Atomic Energy Authority). British Patent 813,723. May 21, 1959.

A homogeneous reactor concept is offered in which corrosive fuel solution is kept away from the core vessel by returning condensate and recombined water through a non-corrosive porous inner lining of the core. This liner would be made of Ti or ZrO_2. (T.R.H.)

Power

15754 ACNP-ERR-3

Allis-Chalmers Mfg. Co. Atomic Energy Div., Washington, D. C.

ELK RIVER REACTOR. Quarterly Project Report for December 1958; January—February 1959. 62p. Contract AT(11-1)-654. $10.80(ph), $3.90(mf) OTS.

Design and construction are proceeding satisfactorily. Fuel capsule irradiation studies are progressing, and preparation of specifications for fuel elements and assemblies is almost complete. Other design, development, and construction progress is reported. Instrumentation developments are described. Reactor physics studies are reported. (For preceding period see AECU-4013.) (T.R.H.)

15755 AECU-4159

Duquesne Light Co., Shippingport, Penna.

AIR DIFFUSION IN THE AIR OPERATION WATER FLASK. SECTION I. Test Results DL-S-205 (T-641110). First issue, Mar. 24, 1959. 10p. $1.80(ph), $1.80(mf) OTS.

The effect of continuous air pressurization on the oxygen concentration of the water in the valve operating system water flask was determined. Oxygen concentration in the flask increased during the testing period of seventeen days. The distribution varied from 12 ppm in the water near the top of the flask to 7 ppm in the water near the bottom. (W.D.M.)

15756 AECU-4168

Duquesne Light Co., Shippingport, Penna.

MONTHLY OPERATING REPORT [FOR] MARCH 1959. 44p. Contract AT(11-1)-292. $7.80(ph), $3.30(mf) OTS.

Operation, maintenance, and testing of the Shippingport Power Plant for March 1959 are summarized. Waste disposal and personnel training are discussed. (For preceding period see AECU-4154.) (W.D.M.)

15757 AECU-4184

Columbia Univ., New York.

BURNOUT STUDIES FOR THE DU PONT POWER REACTOR. Summary Report. William Begell. Mar. 31, 1959. 25p. Contract AT(30-3)-187. (CU-2-59-AT-187-Ch.E.). $6.30(ph), $3.00(mf) OTS.

Burnout results of eighteen experiments with electrically heated, water cooled, hollow, stainless steel tubes are presented. Applicability of the results and of the developed formulas to three types of coolant geometries of the power reactor is discussed. Vibration phenomena, encountered during the burnout study are described. (auth)

15758 ANL-6014

Argonne National Lab., Lemont, Ill.

THE KINETICS AND STABILITY OF FAST REACTORS WITH SPECIAL CONSIDERATIONS OF NONLINEARITIES (thesis). Henry A. Sandmeier. June 1959. 83p. Contract W-31-109-eng-38. $2.25(OTS).

The dynamic behavior of a fast reactor, when the neutron flux is considered as a function of time, is considered. The kinetics of a fast reactor can be grouped into three distinct areas of interest; the first being the normal operating conditions where all the changes are brought about in a slow manner, and the resulting flux changes being small in comparison with the steady state flux. Since the available reactivity and the power density of most large thermal reactors is so small, and the heat capacity is so large, nothing but small deviations from design conditions would occur before the control rods were inserted. Thus reactor kinetics traditionally has meant linear kinetics, which in the mathematical interpretation leads to linearized kinetic equations. The second area is where there is much stronger coupling between reactivity and geometrical changes in the core. A fast reactor has a much higher power density than a thermal reactor and geometrical changes will therefore be more effective on reactivity. A fast reactor needs a greater total amount of U-235 because the fission cross section of U-235 is several hundred times smaller at neutron energies of the order of 0.1 Mev as compared to thermal energies. A fast reactor will always be smaller than a thermal reactor assuming the same power production. Stability and the influence of non linearities are discussed. (A.C.)

15759 BAW-1015(Rev.)
Babcock and Wilcox Co. Atomic Energy Div.,
Lynchburg, Va.
DETERMINATION OF THE PURIFICATION RATE FOR NORMAL OPERATION. NUCLEAR MERCHANT SHIP REACTOR. June 1958. 28p. Contract AT(30-3)-274. $4.80(ph), $2.70(mf) OTS.

The purification flow rate recommended for the NMSR primary loop water is 9830 lb/hr for normal operation. This flow rate is equivalent to 25 gpm at the loop's average operating conditions (508°F and 1750 psia) and 19.8 gpm at the demineralizers operating conditions (110°F and 50 psia). The flow rate is expected to maintain the radiation level resulting from corrosion product activities and other impurity activities, excluding fission products, which are dissolved and suspended in the water at less than 200 mr/hr near the main primary piping wall 30 minutes after normal reactor shut-down, and maintain the corrosion product impurity level in the primary water at less than 1.0 ppm as Fe_3O_4. (auth)

15760 BMI-1342
Battelle Memorial Inst., Columbus, Ohio.
PWR CORE 2 MODEL STUDIES TO IMPROVE INLET-PLENUM-CHAMBER MIXING. Lawrence J. Flanigan, Gale R. Whitacre, and Herbert R. Hazard. May 7, 1959. 70p. Contract W-7405-eng-92. $2.00(OTS).

In the course of the PWR Core 2 study program, studies to improve mixing in the lower plenum were carried out using a quarter-scale air-flow model. By use of vanes to form a strong vortex in the lower plenum, excellent lower-plenum mixing was obtained with only slight increase in pressure drop. For the studies relating to a 9-ft core design, the model core was extended downward 4½ in. below the Core I position. The flow baffle used for this configuration extended below the four inlets, with the result that considerable pressure loss occurred in the lower plenum. It was found that mixing could be greatly improved by use of deflectors to divert the inlet flow in a tangential direction. Data on lower-plenum mixing, core-flow distribution, thermal-shield-flow directions and velocities, flow-baffle orifice coefficients, and pressure losses were obtained for the 9-ft core configuration both with flow deflectors and without them. The flow deflectors greatly improved mixing at the expense of increased lower-plenum pressure loss. For the studies relating to a 7.5-ft core design, the core was extended downward 2¼ in. The flow baffle used for this core design extended to about the center line of the inlets, so that restriction of inlet flow was less than for the 9-ft core. Data for the basic configuration were obtained, following which many types of mixing devices were studied. Use of a vaned ring to produce a strong vortex in the lower plenum resulted in excellent mixing with only slight increase in pressure drop. A similar vaned ring was designed for the prototype by Westinghouse and incorporated in the quarter-scale model. Detailed studies of model performance proved this design satisfactory. (auth)

15761 BW-AED-502
Babcock and Wilcox Co. Atomic Energy Div.,
Akron, Ohio.
A DESIGN STUDY OF A LOW POWER AQUEOUS HOMOGENEOUS BOILING REACTOR POWER PLANT. B. A. Mong, J. E. Colgan, R. A. D'Elia, J. S. Mooradian, G. K. Rhode, and P. M. Wood. June 1, 1955. Decl. Apr. 3, 1959. 172p. Contract AT(11-1)-338. $30.30(ph), $8.70(mf) OTS.

This design study describes a reactor and associated power plant that has been designed to produce 100 kw of net electric power and 400 kw of hot water space heating at a total thermal output of 1300 kw. The fuel consists of a solution of UO_2SO_4 in light water. Power is removed from the core by boiling the fuel solution and transferring the heat to the secondary steam system by condensing primary water on the external surface of a bayonet type boiler and boiling secondary water within the tubes. Saturated steam, produced in the boiler at 225 psia (Full Power) is used to drive a turbo generator. Extraction steam from the turbine is used, at a reduced pressure, for space heating. The initial loading of the reactor is approximately 4.8 kg of U^{235} and operation based on an average load factor of 80% will require fuel addition at the rate of about 580 grams per year. It may be desirable to replace the fuel in the core after a period of 5 years operation due to the accumulation of corrosion products. The reactor control is affected automatically by power demand. The major objective has been to design a reactor that is reliable and simple, requiring little if any operating personnel and routine maintenance only which can be performed by one man. The design should stress simplicity of the system, ease of erection at the site, initial transportability, reliability and ease of operation; these characteristics are then expected to result in greatly reduced effort and manpower support over a conventional system. (auth)

15762 CF-58-7-35
Oak Ridge National Lab., Tenn.
HRT PRESSURE VESSEL TEMPERATURES DURING OPERATION—AN EVALUATION USING DATA FROM RUN 16. R. E. Aven. July 9, 1958. 35p. Contract [W-7405-eng-26]. $6.30(ph), $3.00(mf) OTS.

A study was made of the data taken during HRT Run 16, concerning the temperatures and thermal stresses in the pressure vessel. By making heat balances across the blast shield cooling coils, the pressure vessel cooling system was shown to be performing satisfactorily. Estimates of the thermal stress in the pressure vessel wall show values which range from 1800 psi at low power to 6800 psi at 5 Mw. The thermal stress does not appear to be excessive in this power range. The over-all heat generation in the pressure vessel was estimated to be 108,000 Btu/hr.Mw. By comparing the heat flux at the inside surface of the pressure vessel with the temperature drop across the blanket solution film, which would be required to force compliance with the theoretical equations, a heat transfer film coefficient at this surface may be estimated. A rough correlation between this film coefficient and the temperature drop across the film indicates that heat is being transmitted principally by natural convection. It is recommended that a complete temperature profile be attempted on the replacement reactor pressure vessel. If this cannot be done, then provision for the measurement of the inside surface temperature should be made. (auth)

15763 CF-59-6-17
Oak Ridge National Lab., Tenn.
METHODS OF CONTROLLING CORE-WALL TEMPERATURES IN AQUEOUS HOMOGENEOUS REACTORS. M. W. Rosenthal. June 3, 1959. 22p. Contract [W-7405-eng-26]. $4.80(ph), $2.70(mf) OTS.

The problem of controlling the surface temperatures of core vessels in two-region aqueous homogeneous reactors was examined by analyzing several possible systems for cooling the wall: (1) direction of the inlet core fluid along the wall at a high velocity; (2) passage of heavy water through the wall of a double-wall core vessel; and (3) flow of cool blanket slurry past the wall. If the required flow conditions can be achieved, method (1) will keep the surface temperature within 20°C of the inlet fuel temperature. Should use of that technique alone not be successful, method (2) could be used, with coolant temperatures probably in the range of 100 to 200°C. Use of the blanket slurry to lower the core-side temperature would require that the blanket be much cooler than the core. (auth)

15764 CISE-64
Centro Informazioni Studi Esperienze, Milan.
A FACILITY USED FOR WET STEAM COOLING EXPERIMENTS: PRESSURE DROP, HEAT TRANSFER AND BURNOUT. G. Bertolotti, A. Cicchitti, S. Finzi, M. Silvestri, G. Soldaini, and R. Zavattarelli. Apr. 15, 1959. 45p.

A facility has been designed and built to study the behavior of wet steam. In the facility it is possible to measure pressure drop, maximum (burnout) heat fluxes, and heat transfer coefficients in cylindrical ducts of different geometry for steam—water mixture upward flow at various steam concentrations. (W.L.H.)

15765 CVNA-22
Carolinas Virginia Nuclear Power Associates, Inc., Charlotte, N. C.
QUARTERLY PROGRESS REPORT FOR THE PERIOD JANUARY 1 TO MARCH 31, 1959. May 20, 1959. 128p. For Westinghouse Electric Corp. Contract AT(30-1)-2289, Subcontract No. 1. $21.30(ph), $6.90(mf) OTS.

After evaluating three pressure tube concepts (through-tube, bayonet tube, and U-tube), the U-tube was selected as the concept to be used in the CVTR design. The pressure tube pitch was tentatively established as: pitch of U-tube legs—5.5 inches; pitch of U-tubes perpendicular to plant of U-tubes—8.0 inches; and pitch of U-tubes in place of U-tube—7.5 inches. The concept of fuel cycling is being studied. Two general methods of refueling (cartridge and component) are being actively investigated to determine which is more suitable for CVTR application. The experimental hydraulic program was formulated. The loss of coolant problem is considered to be serious although calculation procedures are not refined enough to accurately predict answers. A pessimistic calculation indicates that an insertion of reactivity of the order of 1% may be possible. After an evaluation of various methods of analyzing the concentration of light water in heavy water, infrared spectrometry was selected to perform this function. (W.D.M.)

15766 DACL-RM-7457-2
Massachusetts Inst. of Tech., Cambridge. Dynamic Analysis and Control Lab.
DYNAMIC BEHAVIOR OF HOMOGENEOUS-CIRCULATING-FUEL REACTOR SYSTEMS. James P. Cunningham, Franklin T. Flaherty, Jr., and John M. Gallagher, Jr. June 3, 1957. 135p. Contract AF33(616)-3398. (AD-146707).

A theoretical study is presented on the dynamic behavior of a power-generating system consisting of a homogeneous-circulating-fuel reactor, a counterflow heat exchanger coupling the fuel loop to a secondary coolant loop, and a power load represented by a temperature drop in the secondary coolant. The system is controlled only by the negative temperature coefficient of reactivity associated with the fuel. The time-dependent one-group diffusion equation is solved for a bare cylindrical reactor, as well as the decay and circulation equations for two groups of delayed-neutron precursors. An analog computer was utilized to find the response of the system to positive and negative step changes in the load under various conditions. The data are analyzed and discussed in terms of the effects of various parameters on dynamic behavior. (W.D.M.)

15767 DP-359
Du Pont de Nemours (E.I.) & Co. Savannah River Lab., Aiken, S. C.
TEMPERATURE DISTRIBUTION IN FUEL ELEMENTS. G. Robert Hoke and Samuel Mirshak. Apr. 1959. 25p. Contract AT(07-2)-1. $0.75(OTS).

Equations and a routine for the IBM 650 to calculate axial temperature distributions in fuel assemblies are presented. The routine can accommodate as many as three heat sources and four coolant channels alternately spaced in either plane or cylindrical geometry. (auth)

15768 HW-57439
General Electric Co. Hanford Atomic Products Operation, Richland, Wash.
OPERATION OF THE NPR FOR BY-PRODUCT POWER. G. R. Hosack. Sept. 22, 1958. 14p. Contract [W-31-109-Eng-52]. $3.30(ph), $2.40(mf) OTS.

A study was made to determine the effect of ultimate bi-company operation on the design and operation of the reference NPR concept. In general it is concluded that operation of the NPR for the simultaneous production of plutonium and by-product electric power is feasible and that it would be reasonable to design such a plant for some interdependence between the reactor operator and the power recovery system operator. (A.C.)

15769 IDO-28540
Aerojet-General Nucleonics, San Ramon, Calif.
ARMY GAS-COOLED REACTOR SYSTEMS PROGRAM. Monthly Progress Report for April 1959. May 25, 1959. 63p. Contract AT-(10-1)-880. $1.75(OTS).

The Army Gas Cooled Reactor System Program includes water moderated heterogeneous reactor (Gas Cooled Reactor Experiment I), a graphite moderated homogeneous reactor (Gas Cooled Reactor Experiment II), a mobile gas cooled reactor (ML-1), and the coordination of the Gas Turbine Test Facility. The progress of each project, the associated tests and data evaluation, the applicable design criteria, and the fabrication of reactor components are briefly summarized. (For preceding period see IDO-28538.) (W.D.M.)

15770 MND-E-1718-1
Martin Co. Nuclear Div., Baltimore.
A BORON DETERMINATION FOR THE APPR-1.
May 25, 1959. 35p. Contract DA-44-009-ENG-3318.

The results are presented of a joint program to investigate the problem of B loss determination resulting from the fabrication of stainless steel—UO_2 dispersion type fuel elements, where B is employed in the fuel element as burnable poison. (W.L.H.)

15771 MND-E-1847-II
Martin Co. Nuclear Div., Baltimore.
ZERO POWER CHECK POINT EXPERIMENTS—ERDL TASK 100, PHASE 3. VOLUME II. Apr. 1959. 121p. Contract DA-44-009-ENG-3318.

The data presented cover the first series of experiments on the ERDL critical experiment reactor. The purpose of the experiments was to establish check points or points of comparison between the ERDL Reactor and the Army Package Power Reactor (APPR-1). Once the differences between the ERDL Reactor and the APPR-1 had been evaluated, the fully loaded design core was assembled. A series of measurements was made on this core to provide reference data for future studies on similar reactors with higher fuel loadings, power flattening, and other advanced features. The various cores studied are summarized. (W.D.M.)

15772 MND-E-2005
Martin Co. Nuclear Div., Baltimore.
ERDL-NPFOR QUARTERLY PROGRESS REPORT NO. 7 [FOR] JANUARY THROUGH MARCH 1959. Apr. 1959. 63p. Contract DA-44-009-ENG-3318.

Corrosion testing of heat exchanger test units is described. In the nucleate boiling program Martin Hardcoat aluminum appeared to provide satisfactory electrical insulation for the test section, the sensitivity of the void detection equipment was improved so that a 1% void can be successfully measured, and a redesign of the test sections was initiated to obtain closer correspondence between the section and an actual fuel element. In the critical experiment program zero power check point experiments the critical water height with three plastic spacers between fuel bundles was determined to be 11.05-in. above the bottom of the active core, gross and fine flux measurements were completed, the reactivity of ERDL, APPR, and ORNL fuel elements were compared, the worth of a Martin APPR prototype control rod was compared with two APPR control rods supplied by ERDL, and the results of analytical studies of the core generally compared well with experimental results. In the critical experiment program core extrapolation experiments fabrication of 115 follower box fuel plates was completed, a modified safety rod actuator was tested and found to meet specifications, analytical predictions of experimental results for all nine cores were completed, and the design of the complete experimental program was completed. (For preceding period see MND-E-2004.) (W.D.M.)

15773 NAA-SR-2952
Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.
DEVELOPMENT OF A FUEL HANDLING SYSTEM FOR AN ORGANIC MODERATED REACTOR. J. A. Leppard. Apr. 1, 1959. 37p. Contract AT(11-1)-GEN-8. $1.00 (OTS).

A fuel handling system has been developed from concepts based on design studies of organic moderated reactor systems. Several methods of handling fuel elements and control rods were designed and evaluated. The features of several systems are described which were rejected as inadequate, and the evaluation of a design leading to the construction of a prototype cask and its associated equipment. The principle features of the prototype system are described, and a typical fuel-handling operational sequence is given. Because this is an interim report, the results of the development and testing program are not available. (auth)

15774 NAA-SR-3151
Atomics International Div., North American Aviation Inc., Canoga Park, Calif.
RADIATION EFFECTS RESULTING FROM FUEL CLADDING FAILURE IN THE 45.5 Mw (THERMAL) ORGANIC MODERATED REACTOR. M. Dunenfeld. June 1, 1959. 26p. Contract AT-11-1-GEN-8. $0.75 (OTS).

Effects of fuel cladding failure on the radioactivity in the coolant of the proposed 45.5 Mw Organic Moderated Reactor (OMR) were studied. Calculated equilibrium values of the dose rate of the surface of an unshielded 16-inch, schedule 40 pipe, for continued full power operation of this reactor are graphically shown. Calculations were based on a cladding failure area of 1 mm^2. Since the half lives of many fission products that emit gamma rays are briefer than the coolant cycle time, the curve shows that the dose rate decreases as coolant travels farther from the core. Dose rates, two hours after shutdown, for four different operating conditions of the purification system are tabulated. Equations for the buildup of this coolant activity are derived in the text. Also shown is the method of calculating the indicated results. To validate certain assumptions, experiments should be conducted on: 1) corrosion rate of uranium under reactor operating conditions; 2) diffusion of fission products through uranium and cladding; 3) adsorption of fission products from the coolant by system surfaces. (auth)

15775 NAA-SR-3341
Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.
LOW-POWER PHYSICS EXPERIMENTS ON THE SODIUM REACTOR EXPERIMENT. R. W. Campbell. June 15, 1959. 47p. Contract AT-11-1-GEN-8. $1.50 (OTS).

A series of experiments was performed during the loading and low-power operation of the SRE to determine some of the more basic nuclear characteristics. Critical masses were determined and found to be 22.2 fuel elements, or 42.4 kg of uranium-235, for the dry reactor (no sodium present), and 32.6 fuel elements, or 62.2 kg of uranium-235, for the wet reactor (sodium present at 180°C). Neutron flux mappings were obtained and were found to be in general agreement with theory in the core region; however, discrepancies were observed in the reflector region and biological shielding. The average reactivity worth was found to be approximately 2.0% for control rods and approximately 1.5% for safety rods. A measurement of the isothermal temperature coefficient of reactivity found it to be $+1.36 \times 10^{-3}$%/°F at 400°F, to decrease with increasing temperature, and to approach 0.0%/°F at about 800°F. Also, danger coefficients were measured on a number of experimental reactor elements. (auth)

15776 NAA-SR-3482
Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.
DEVELOPMENT OF THE SRE MARK II SAFETY ROD.
E. C. Phillips and R. G. Hoff. June 15, 1959. 25p.
Contract AT(11-1)-GEN-8. $0.75(OTS).

The SRE Mark II safety rod consists of a neutron absorbing column suspended from an electromagnet, which, when de-energized, allows the column to fall into the reactor core. The kinetic energy of the falling column is expended in a gas-compression shock absorber. The poison column is returned to the storage position by an electromagnet attached to a chain drive which is coupled to a position-indication system. The electromagnet was tested for electrical characteristics, holding force, and release time. An effective insertion time of 0.7 second was measured for the entire rod. (auth)

15777 NAA-SR-3515
Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.
TWO-GROUP SRE FLUXES IN TWO DIMENSIONS.
A. R. Vernon. June 15, 1959. 18p. Contract AT-11-1-GEN-8. $0.50(OTS).

Several two-group diffusion problems, representing the Sodium Reactor Experiment, were solved by means of NICK-2, a two-dimensional (r, z) multigroup diffusion code. The problems represented the following operational conditions: Wet criticality—33 elements loaded and all components at a uniform temperature of 180°C. Low temperature operation—43 elements loaded, inlet coolant temperature 260°C, and outlet coolant temperature 343°C. High temperature operation—43 elements loaded, inlet coolant temperature 260°C, and outlet coolant temperature 516°C. Two two-dimensional fluxes and power densities are given for the above cases. In addition, the results for reactivity and critical mass are compared with the results of the usual one-dimensional approximation, assuming separability of the fluxes in cylindrical coordinates. The close agreement obtained indicates that the one-dimensional approximation represents the two-dimensional situation quite well, even for high temperature operation. (auth)

15778 NDA-84-20
Nuclear Development Corp. of America, White Plains, N. Y.
TESTING OF SODIUM PIPE JOINTS AND DEVELOPMENT OF REMOTE REPAIR TOOLS FOR THE SDR.
H. Belofsky, S. Lazarus, and B. Minushkin. May 22, 1959. 52p. Contract AT(30-3)-256. $9.30(ph), $3.60 (mf) OTS.

1. Remote Repair. Pre-prototype tools have been designed, constructed and successfully tested over working distances approximating full scale reactor dimensions, thus demonstrating the feasibility of remotely repairing and replacing a fuel-coolant tube in an SDR. These tools and their extensions performed the operations of internal tube cutoff, facing, chip collection, external tube cutoff, internal straight access and internal right angle access fusion butt welding over a working distance of 30 ft. It is estimated that the total time required for the repair or replacement of a fuel-coolant tube using remote repair techniques is approximately 13 hr with no required waiting period. On the other hand, it has been estimated that it takes approximately 16 hr plus a 14-day waiting period to effect a fuel-coolant tube replacement by manual techniques. It is this 2-wk radioactive decay time which may be eliminated by the use of remote maintenance techniques. In addition to savings in reactor maintenance cost, savings in construction may also be possible because simpler neutron shielding is used. Tools similar to those designed in this program may be utilized for remote repair of pressure tube reactors of similar configurations, and for repair of tubular heat exchangers wherever accessibility for manual maintenance is hazardous or costly. 2. Temporary Plugs. The feasibility of temporarily maintaining a damaged fuel coolant tube was demonstrated. Such temporary repair entails the insertion of a mechanical plug which is subsequently expanded to seal the fuel-coolant tube and/or pigtail from sodium flow. Three types of plug designs were subjected to (1) isothermal sealing tests against gas pressure and vacuum at room and elevated temperatures, and (2) thermal cycling tests while sealing against pressurized static sodium in a closed system. Only one plug design successfully sealed under both isothermal and thermal cycle test conditions. This plug successfully sealed against 60 psi pressurized sodium for 24 hr at 300°F and for four 2 hr cycles between 300 and 500°F. A leak developed after six additional 2 hr cycles between 400 and 900°F. The severe rate of temperature change, 500°F/hr, is several times the normal rate of temperature change (approximately 50 to 100°F/hr) expected under actual operating conditions. It is felt that modifying this plug design to incorporate a metal seal ring of NDA design would permit it to remain leaktight at even higher temperatures. 3. Mechanical Joints. Commercially available mechanical joints for connecting sodium piping were tested and evaluated under conditions simulating those expected in the upper header room of the 10 MW$_e$ SDR. Testing consisted primarily of thermal cycling between 1050 and 900°F at a rate of 10°F/min in pressurized sodium at 100 psig. In addition, the joints were cycled down to room temperature once each day to permit visual inspection. As a measure of reliability and ease of handling, the joints were each disassembled and reassembled a number of times. The Marman Conoseal couplings gave no evidence of leakage. Two 1-in. stainless steel Marman couplings logged a combined total of over 3300 thermal cycles and $\sim$2000-hr of continuous trouble-free operation under moderately severe conditions. (auth)

15779 NDA-84-21
Nuclear Development Corp. of America, White Plains, N. Y.
DESIGN DEVELOPMENT TESTS OF SOME COMPONENTS FOR THE 10 MW$_E$ SDR. C. Bolta, B. Minushkin, H. Steinmetz, and O. Sullivan. May 25, 1959. 69p. Contract AT(30-3)-256. $10.80(ph), $3.90 (mf) OTS.

A sodium leak from a fuel-coolant tube and a water leak from a calandria tube were deliberately induced to study the effect of these leaks on a barrier. A program directed at improving leak detection devices and developing better methods of leak detection is reported. Prototype fuel-coolant tube closure devices were experimentally evaluated at simulated reactor operating conditions to obtain useful design data. Devices to join the calandria tubes to the tube sheet while maintaining a gastight seal were experimentally evaluated. (W.L.H.)

15780 ORNL-1845(Del.)
Oak Ridge National Lab., Tenn.
OPERATION OF THE AIRCRAFT REACTOR EXPERIMENT. W. B. Cottrell, H. E. Hungerford, J. K. Leslie, and J. L. Meem. Sept. 6, 1955. Decl. with deletions Feb. 12, 1959. 245p. Contract W-7405-eng-26. $3.50 (OTS).

The Aircraft Reactor Experiment (ARE) was operated successfully and without untoward difficulty in November 1954. The reactor became critical with a mass of 32.8 lb of U^{235}, which gave a concentration of 23.9 lb of U^{235} per cubic foot of fluoride fuel. For operation at power, the U^{235} content of the fuel mixture was increased to 26.0 lb/ft^3, and thus the final composition of the fuel mixture was 53.09 mole % NaF, 40.73 mole % ZrF_4, and 6.18 mole % UF_4. The maximum power level for sustained operation was 2.5 Mw, with a temperature gradient of 355°F; the maximum fuel temperature at this level was 1580°F. Temperatures as high as 1620°F were recorded during transients. From the time the reactor first went critical until the final shutdown, 221 hr had elapsed, and for the final 74 hr the power was in the megawatt range (0.1 to 2.5 Mw). The total integrated power was about 96 Mw-hr. While at power the reactor exhibited excellent stability and it was easily controlled because of its high negative temperature coefficient of reactivity, which made the reactor a slave to the load placed upon it. The fuel temperature coefficient was -9.8×10^{-5} $(\Delta k/k)/°F$, and the over-all coefficient for the reactor was -6.1×10^{-5}. Practically all the gaseous fission products and probably some of the other volatile fission products were removed from the circulating fuel. In a 25-hr run at 2.12 Mw the upper limit of the reactor poisoning due to xenon was 0.01% $\Delta k/k$. No more than 5% of the xenon stayed in the molten fluoride fuel. The total time of operation at high temperature (1000 to 1600°F) for the sodium circuit was 635 hr, and, for the fluoride fuel system, 462 hr. During most of the operating period the sodium was circulated at 150 gpm and the fuel at 46 gpm. The fabricability and compatibility of the materials system, i.e., fluoride fuel, sodium coolant, and Inconel structure, were demonstrated, at least for the operating times, temperatures, and flux levels present. All components and, with few exceptions, all instrumentation performed according to design specifications. The performance of the pumps was particularly gratifying, and the low incidence of instrumentation failure was remarkable in view of the quantity and complexity of the instruments used. (auth)

15781 ORO-T-377
Johns Hopkins Univ., Bethesda, Md. Operations Research Office.
NUCLEAR POWER FOR THE PRODUCTION OF FUELS IN OVERSEAS THEATERS. E. Eugene Howe, Theodore S. Needels, W. Robert Tomlinson, Jr., and Bernard B. Watson. Oct. 1958. 66p. (AD-118519).

A preliminary analysis is presented of the feasibility of using nuclear energy for the production of military fuels in overseas theaters of operations with the objective of finding a means of reducing the heavy logistical burden associated with supplying fuel to overseas forces. (auth)

15782 PRC-258
Propulsion Research Corp., Santa Monica, Calif.
ESCHER WYSS CLOSED CYCLE AIRCRAFT POWERPLANT STUDY. PART 1. SUMMARY AND EVALUATION OF PHASE I. Rolf D. Buhler. May 8, 1957. 65p. Project No. 127187. Contract AF18(603)-27. (AFOSR-TR-57-36; AD-126569).

Various ducted fans driven by closed cycle gas turbines were studied. For chemical fuels, two arrangements were considered for the combustion chamber containing the closed cycle gas heater: (a) as part of a separate turbojet engine ("external heat source"), and (b) as an afterburner in the ducted fan air flow ("self contained closed cycle engines"). For nuclear fuels the high-temperature gas-cooled reactor was considered the most likely heat source ("single loop system"). One closed cycle powerplant with external gas heater was fairly completely designed. The component weights of this engine were used as a basis for weight estimates of the other engines. Two other closed cycle applications were briefly investigated: a high altitude secondary powerplant, and a boundary layer suction fan drive system. The closed cycle ducted fans using chemical fuels were found to be too heavy and complicated to be competitive with open cycle engines. The gas-cycle nuclear engine looked promising for subsonic and possibly for low supersonic propulsion. Further work on this was initiated. As secondary powerplants for future high altitude flight vehicles, closed cycle turbines promise to have a definite field of application. (auth)

15783 PRWRA-GNEC-1
Puerto Rico Water Resources Authority, San Juan and General Nuclear Engineering Corp., Dunedin, Fla.
BOILING NUCLEAR SUPERHEATER(BONUS) PROJECT. Interim Report. Feb. 28, 1959. 173 p. Contract AT (40-1)-2484, PRWRA Subcontract No. NP-1. $3.00 (OTS).

A review of superheater concepts was completed, and design analysis leading to establishment of general design features for the proposed prototype were carried out. Two design concepts were developed and are described. In a typical boiling reactor producing saturated steam at 900 psig only about 28% of the heat energy is converted into electricity. If the temperature of this steam were raised from 534° to 900°F through introduction of additional energy, 50 to 60% of this additional energy could be converted to electricity. Saturated steam will be normally produced in the boiling zone of the reactor at 900 psig and 534°F. The temperature of the steam will be raised to 900 to 950°F as it passes through the superheater zone. Slightly enriched UO_2 appears to be the most logical choice of fuel material in both the boiling and superheater regions. (A.C.)

15784 SG-VAL-2(2nd. Ed.)
General Electric Co. Vallecitos Atomic Lab., [San Jose, Calif.].
GENERAL ELECTRIC VALLECITOS BOILING WATER REACTOR. Final Hazards Summary Report. D. L. Fischer, L. Kornblith, Jr., D. McDaniel, J. L. Murray, E. Strain, and S. Untermyer. May 8, 1958. 312p. $50.40(ph), $11.10(mf) OTS.

All the pertinent information describing the Vallecitos Boiling Water Reactor contained in the first edition, amendments to the License Application, the results of analytical studies, and experimental data obtained during operation is consolidated. The maximum and minimum limits of reactor operation are set forth. Descriptions of the reactor, the facility, and the site; procedures for reactor operation and fuel testing; and plans, procedures, and protective devices relating to operational mistakes, accidents, or equipment failure are presented. The maximum credible accident and waste disposal are discussed. (W.D.M.)

15785 TID-3530

Technical Information Service Extension, AEC.

PRESSURIZED WATER REACTORS. A Literature Search. Sidney F. Lanier, comp. June 1959. 32p. $ 1.00 (OTS).

The search is limited to references on the Shippingport Pressurized Water Reactor, Army Package Power Reactor, Indian Point Reactor, N S Savannah (nuclear merchant ship) Reactor, and general reports on pressurized water reactors. All references listed are unclassified. (auth)

15786 WAPD-PWR-(RD2)-266

Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.

VARIABLE FLOW RESISTANCE WITH ADJUSTABLE MULTIPENETRATION ORIFICE PLATES IN SERIES. Frank A. Grochowski. Oct. 17, 1958. 24p. $4.80(ph), $2.70(mf) OTS.

Full-scale water flow tests were performed to determine the feasibility of a variable resistance orificing scheme for PWR Core 2. A low temperature, low pressure loop was used, and three, two, and one multi-hole and multi-slot orifice plates in series were tested. For the three and two plates in series, the range in flow resistance was determined for the condition where all penetrations were aligned to the condition of maximum misalignment. Flow characteristics of a single multi-hole and multi-slot plate were also studied. Tests performed on the multi-hole and multi-slot orifices in series showed that a considerable range of flow resistance could be obtained when the alignment of penetrations is varied. For the area ratio, which gave the largest resistance to flow, the results showed a range in pressure loss coefficient of about 1 to 6 in the case of three multi-hole plates and about 1 to 4 for three multi-slot plates. For the multi-hole geometry tested, the increase in flow resistance with angular misalignment was very high and occurred over an angular rotation of the center plate of 15°. Employing angular slots allowed greater freedom in the choice of the range of angular rotation to go from the minimum to the maximum flow resistance conditions. For this reason the angular slot configuration will be considered for further study for application in PWR Core 2. (auth)

15787 WCAP-1217

Westinghouse Electric Corp. Atomic Power Dept., Pittsburgh.

CAROLINAS VIRGINIA NUCLEAR POWER ASSOCIATES CVTR PROJECT MONTHLY PROGRESS REPORT [FOR] MAY 1959. 25p. $4.80(ph), $2.70(mf) OTS.

Development and status of various tasks and programs of the Parr Shoals Power Reactor are summarized. (For preceding period see WCAP-1183.) (W.L.H.)

15788 YAEC-111

Westinghouse Electric Corp. Atomic Power Dept., Pittsburgh.

HYDRAULIC SHOCK ABSORBERS FOR THE YANKEE REACTOR CONTROL RODS. A. A. Bishop and R. T. Berringer. Mar. 1959. 58p. For Yankee Atomic Electric Co. Contract AT(30-3)-222, Subcontract No. 1. $ 9.30 (ph), $ 3.60 (mf) OTS.

Variable orifice type hydraulic shock absorbers, based on a theoretical constant deceleration range of 6 to 12 times the acceleration of gravity, an effective buffer distance of 5 to 6 inches, and a displacement of 69 in.^{3} of water were designed for the control rod assemblies. Tests were conducted at atmospheric pressure and room temperature. High speed photography and accelerometer-Brush recorder techniques were used to obtain and analyze the data. Although the theoretical contour of the shock absorber piston is fitted by a cubic equation, the contour was approximated by either a double or a triple tapor to simplify the machining. A range of hydraulic loss coefficients of 0.9 to 1.5 was used in the design of the test shock absorbers. Test data revealed that the approximation of the theoretical contour by straight line tapers is justified. A significant improvement in dashpot performance was obtained for the triple taper design Based on the test data a triple taper hydraulic shock absorber having a hydraulic loss coefficient of 1.2 and an average deceleration of 10 g's is proposed for the Yankee reactor control rods. It is expected that the maximum deceleration will not exceed 15 g's. (auth)

15789 YAEC-110

Westinghouse Electric Corp. Atomic Power Dept., Pittsburgh.

END CLOSURES FOR YANKEE FIRST CORE FUEL RODS. G. G. Lessmann. May 1959. 44p. For Yankee Atomic Electric Co. Contract AT(30-3)-222, Subcontract No. 1. $7.80(ph), $3.30(mf) OTS.

Stainless steel clad fuel rods for the Yankee Atomic Electric Company nuclear power plant are sealed on both ends with welded end plugs. A tungsten inert gas shielded arc welding process, developed for this purpose, is presented. Welding parameters and equipment requirements are considered in detail. In addition, inspection results are given for 3320 end closures. (auth)

15790 YAEC-117

Westinghouse Electric Corp. Atomic Power Dept., Pittsburgh.

DEVELOPMENT OF AGENTS AND PROCEDURES FOR DECONTAMINATION OF THE YANKEE REACTOR PRIMARY COOLANT SYSTEM. R. M. Watkins. Mar. 1959. 52p. For Yankee Atomic Electric Co., Contract AT(30-3)-222, Subcontract No. 1. $ 9.30 (ph), $ 3.60 (mf) OTS.

Developments relative to decontamination achieved under the Yankee Research and Development program are reported. The decontamination of a large test loop which had been used to conduct corrosion rate studies for the Yankee reactor program is described. The basic permanganate-citrate decontamination procedure suggested for application in Yankee reactor primary system cleanup was used. A study of the chemistry of this decontamination operation is presented, together with conclusions pertaining to the effectiveness of the solutions under the conditions studied. In an attempt to further improve the efficiency of the procedure, an additional series of static and dynamic tests was performed using contaminated sections of stainless steel tubing from the original S1W steam generator. Several variables in the process (reagent composition, contact time, temperature, and flow velocity) were studied. The changes in decontamination efficiency produced by these variations are discussed and compared with results obtained through the use of similar procedures. Based on the observations made, conclusions are drawn concerning the optimum conditions for the cleanup process, a new set of suggested basic permanganate-citrate decontamination instructions is presented, and recommendations are made concerning future studies involving this procedure. (auth)

15791 YAEC-129

Westinghouse Electric Corp. Atomic Power Dept., Pittsburgh.

MONTHLY PROGRESS REPORT FOR THE PERIOD

MAY 1 TO 31, 1959. H. E. Walchli. June 20, 1959. 13p. For Yankee Atomic Electric Co. Contract AT(30-3)-222, Subcontract No. 1. $3.30(ph), $2.40(mf) OTS.

Brief reports are given of work on mechanical design, thermal and hydraulic design, control rod development, and radiation damage experiments. (For preceding period see YAEC-127.) (T.R.H.)

15792

A TRANSIENT HIGH FLUX REACTOR. Atomic World 10, 140-1(1959) Apr.

Design and operation of the Transient Reactor Test Facility at Argonne are described. The reactor was constructed to generate a large transient thermal flux of short duration to permit studies on fast reactor fuel elements to their melting point. Important design parameters are listed. (J.R.D.)

15793

NUCLEAR ENERGY IN SPAIN. Atomic World 10, 145-7; 154(1959) Apr.

A review of the progress in Spain made in the nuclear power field is presented. Production of electric power is shown graphically for post war years and the nuclear energy progress to date is reviewed. Plans for future developments are given and an outline of Spanish industry is presented. (J.R.D.)

15794

THE INTERNALLY COOLED, LIQUID METAL FUEL REACTOR. A. N. Byford. Atomic World 10, 223-6; 247(1959) June.

In considering suitable reactor systems for nuclear ship propulsion for ships in the 15,000-39,000 dwt class, the Hawker Siddeley Co. decided the internally cooled liquid metal fuel reactor showed promise. The reactor system uses graphite as the moderator and a bismuth uranium solution as the fuel. The coolant can be a gas (He) or bismuth. Design, coolant and circuits, and pressure vessel are discussed briefly. (W.D.M.)

15795

THE NUCLEAR PROPULSION OF SHIPS. H. W. Bowker (Atomic Energy Research Establishment, Harwell, Berks, Eng.). Atoomenergie 1, 67-73(1959) May.

Progress in various countries on solving the problems of safety requirements, weight considerations, ship pitch and roll, economics, and communications in the application of nuclear power to ships is examined. Efforts discussed include work in UK, US, USSR, and France. (W.D.M.)

15796

APPLICATION OF NUCLEAR ENERGY FOR SHIP PROPULSION IN GERMANY. Kurt Illies (Technische Hochschule, Hanover and Universität, Hamburg). Atoomenergie 1, 74-6(1959) May. (In German)

A survey is presented of the work being done in Germany on the development of reactors for ship propulsion. The development work is conducted by an association of the federal government, the four coastal states, and private industry. The initial step was the construction of a swimming pool reactor for materials testing, radiation protection investigation, and research on coolant and moderator circuits. The second step consisted in the study of various reactor types and circuits with respect to their adaptability to ship propulsion. The pressurized water reactor, the organic moderated and cooled reactor, and the boiling water reactor were considered. The organic moderated and cooled reactor was selected. Construction studies are being made. (J.S.R.)

15797

SHIPPING AND ATOMIC ENERGY WITH SPECIAL REFERENCE TO NORWEGIAN NUCLEAR PROPULSION WORK. Emil Jansen (Institutt for Atomenergi, Kjeller, Norway). Atoomenergie 1, 77-81(1959) May.

Co-ordination of efforts and financial and technical support for nuclear ship propulsion in Norway are discussed. The reactor type chosen as showing most promise for early economic utilization was the boiling light water reactor with 2-3% enrichment uranium oxide powder stainless steel clad. It is estimated that firm specifications and plans for a nuclear propelled oil tanker will be available within the next 2-3 years. (W.D.M.)

15798

BACKGROUND DUTCH INTERESTS IN NUCLEAR SHIP PROPULSION. M. Boogaardt (Reactor Centrum Nederland, The Hague and Technical Univ., Eindhoven, Netherlands). Atoomenergie 1, 82-90(1959) May.

A survey is presented of the background of present thinking on nuclear propulsion of merchant vessels in the Netherlands. An estimate of the amount of money involved in the replacement of Dutch ships around 1965 is made. The reasons are discussed for considering nuclear shipbuilding and choosing the pressurized water reactor for study. (W.D.M.)

15799

POWER REACTORS. J. Diamond (Univ. of Manchester, Eng.). J. Brit. Nuclear Energy Conf. 4, 97-106(1959) Apr.

Trends in current and future power reactor development are exemplified in a discussion of economics, operating experience, and reactor design, safety, marine propulsion, and national development. (T.R.H.)

15800

POWER REACTORS. Kowarski (Centre Européen de Recherches Nucléaires, Geneva). p.59-66 of "Journées d'Information sur l'Énergie Nucléaire, 14-15-16 Janvier 1957." Documents, Suppl. to No. 114. France, Commissariat General á la Productivité. 1957. 203p. (In French)

The primary considerations in the choice of a power reactor are the selection of the fuel type, the conversion power, the chemical processing, and the natural, human, and financial resources available. Each consideration is briefly discussed. A survey of the technical possibilities is made on the basis of the coolant system and moderator system used. National development programs for the United States, Russia, and Europe are indicated. (J.S.R.)

15801

REMARKS ON NUCLEAR PROPULSION OF SHIPS. INTRODUCTION. Jean Hainzelin. p.97-100 in "Journées d'Information sur l'Énergie Nucléaire, 14-15-16 Janvier 1957." Documents, Suppl. to No. 114. France, Commissariat General á la Productivité. 1957. 203p. (In French)

Considerations imposed by the utilization on board ship of any energy source and the consequences in the particular case of a nuclear installation are discussed. The mechanical consequences of an installation on a floating body, the dependence on weight and space limitations, and the peculiarities of marine installation in the matter of safety are considered. (J.S.R.)

15802

NUCLEAR PROPULSION OF SHIPS. Jean Hainzelin. p.101-13 in "Journées d'Information sur l'Énergie Nucléaire, 14-15-16 Janvier 1957." Documents, Suppl. to No. 114. France, Commissariat General á la Productivité. 1957. 203p. (In French)

The nuclear ships under construction in the United States are briefly reviewed. A summary is made of the availability of nuclear fuels. The reactor types which can be considered for marine propulsion are the aqueous homogeneous reactor, fast reactors, intermediate reactors, and thermal reactors, which include pressurized reactors, organic cooled and moderated reactors, boiling reactors, and closed circuit gas reactors. The advantages and disadvantages of each are considered. The technological problems in the fabrication of nuclear propulsion devices are examined. Nuclear propulsion of commercial ships is discussed with a consideration of the reactor type, auxiliary propulsion, economic factors, and the planning and construction of prototypes. (J.S.R.)

15803

THE ATOMIC PROGRAMS. Jules Guéron (Commissariat à l'Energie Atomique, Paris). p.149-57 of "Journées d'Information sur l'Énergie Nucléaire, 14-15-16 Janvier 1957." Documents, Suppl. to No. 114. France, Commissariat General á la Productivité. 1957. 203p. (In French)

The national nuclear programs of the United States, Russia, and Great Britain are briefly reviewed. As the development of a nuclear industry is dependent on the nuclear fuel available in the country and the industrial production of nuclear materials, the development program in France is discussed in some detail on this basis. (J.S.R.)

15804

THE PRODUCTION OF ELECTRICAL ENERGY OF NUCLEAR ORIGIN. Ailleret. p.159-67 of "Journées d'Information sur l'Énergie Nucléaire, 14-15-16 Janvier 1957." Documents, Suppl. to No. 114. France, Commissariat General á la Productivité. 1957. 203p. (In French)

The energy potential of France is briefly reviewed as an introduction to a discussion of the development of nuclear power. The first stage in the development was the construction of the experimental natural uranium graphite reactors, the G-1, G-2, and G-3. The industrial stage was reached with the planning of the EDF-1 and EDF-2. These reactors are intended primarily for the production of electrical power. The EDF-1 reactor will be an extension of the experimental reactors, but the EDF-2 reactor will utilize superheating. The economic aspects of nuclear installations are considered. The objectives, programs, and development plans of France are considered with respect to short and long term perspectives. (J.S.R.)

15805

PRIVATE INITIATIVE AND ELECTRICAL ENERGY OF NUCLEAR ORIGIN. Pierre Taranger (Commissariat à l'Énergie Atomique, Paris). p.169-73 of "Journées d'Information sur l'Énergie Nucléaire, 14-15-16 Janvier 1957." Documents, Suppl. to No. 114. France, Commissariat General á la Productivité. 1957. 203p. (In French)

Nuclear power in its initial stages is a state monopoly because of the vast expenditures required and, in the United States, the secrecy of the initial experiments. The evolution of nuclear industry in the United States, Great Britain, and France is surveyed, with special emphasis on the development in the United States. The areas of growth and expansion of private enterprise in the nuclear field in France is then discussed, and the possible areas of future development are indicated. (J.S.R.)

15806

URANIUM-235 AND PLUTONIUM—CADENCE AND ACCOMPLISHMENT. Richard Baumgartner. p.187-91 of "Journées d'Information sur l'Énergie Nucléaire, 14-15-16 Janvier 1957." Documents, Suppl. to No. 114. France, Commissariat General á la Productivité. 1957. 203p. (In French)

The development of nuclear power in France will fall into two phases, the use of natural or slightly enriched uranium for reactor fuel and the use of plutonium for reactor fuel. The first period, which will extend to about 1965, has the program of constructing nuclear power stations, research and prototype reactors, an isotope separation plant for uranium, prototypes for marine reactors, and finally reactors for exportation. In the second period, plutonium will be used as fuel, but the energy needs after 1965 are too uncertain for definite plans to be made. (J.S.R.)

15807

CONSIDERATION OF SAFETY IN NUCLEAR MERCHANT SHIPS. Richard P. Godwin and K. William Hess (U. S. Atomic Energy Commission, Washington, D. C.). J. Joint Panel Nuclear Marine Propulsion 3, 10-16(1959) Apr.

Although safety considerations cannot be restricted to the reactor, design aspects of the nuclear power plant and its effect upon the ship are discussed primarily. The ship is considered as an operating unit and its design and operation reflects a general upgrading with respect to collision and fire resistance, waste handling, navigation and communication equipment, auxiliary power, and maintenance. A brief description of the N.S. Savannah is given and safety measures are discussed in detail. (W.D.M.)

15808

CONTROLLING INSTABILITIES IN GRAPHITE POWER REACTORS. J. G. Tyror (Atomic Energy Research Establishment, Harwell, Berks, Eng.). Nuclear Power 4, No. 38, 94-7; 124(1959) June.

Instability is defined, and the two principal sources of instability in graphite-moderated natural-uranium power reactors are discussed: temperature effects and xenon effects. (T.R.H.)

15809

CHAPELCROSS: COMMISSIONING THE FIRST REACTOR. D. R. R. Fair (United Kingdom Atomic Energy Authority). Nuclear Power 4, No. 38, 104-11(1959) June.

A discussion is given of: training of personnel, plant manuals, reactor precommissioning tests, loading to criticality, measurements near criticality, loading to full size, control rod calibration, hot gas circuit and burst slug detection equipment tests, reactor to power, and power plant commissioning. A tabulation of data on the Chapelcross station is included. (T.R.H.)

15810

A NEW CONCEPT IN POWER PLANTS. A. P. Fraas (Oak Ridge National Lab., Tenn.). Nuclear Power 4, No. 38, 118-9(1959) June.

A preliminary study of a reciprocating engine coupled to a gas-cooled reactor is reported and discussed. A system pressure of 100 atm. will lead to an over-all thermal efficiency of 30%. The system offers lower capital investment, low enrichment with low critical mass, good conversion ratio, high burnup, and low fuel fabrication costs. Specifications are given for the proposed Nuclear Gas Engine (NGE-1). (T.R.H.)

15811

MEASUREMENT OF THE DOPPLER TEMPERATURE EFFECT IN AN EBR-1 TYPE ASSEMBLY. W. Y. Kato and D. K. Butler (Argonne National Lab., Lemont, Ill.). Nuclear Sci. and Eng. 5, 320-30(1959) May.

A measurement of the Doppler temperature effect was made in the fast spectrum of a mockup of the EBR-I reactor in ZPR-III. The effect was measured by thermal cycling samples of enriched uranium, natural uranium, and plutonium and detecting the small changes in reactivity. The pile oscillation technique using a resonant detector was employed to measure the small oscillating component of the neutron flux. An upper limit of 0.5×10^{-8} $\Delta k/\Delta T$ was obtained for a 506-gm sample of U^{235} in the spectrum of an EBR-I mockup, and for a 235-gm sample of Pu^{239} in a plutonium-fueled assembly of the same configuration. The results for natural uranium were inconclusive. (auth)

15812

POWER REACTOR TECHNOLOGY. Technical Progress Reviews, Vol. 2, No. 3. Dunedin, Fla., General Nuclear Engineering Corp., 1959. 68p. $0.55(GPO).

Selected phases of research and development for which there have been significant advances or a heightened interest in the past few months are discussed. The various areas of reactor development are covered from the general viewpoint of the reactor designer rather than from the more detailed points of view of specialists in the individual areas. General research and development topics discussed include nuclear fuel resources and fuel utilization, nuclear merchant ship propulsion, physics of D_2O lattices, burn-out limits of polyphenyl coolants, reactor safety and containment, safe handling of radioisotopes, and graphite—uranium and uranium—magnesium fuel elements. Progress on the Pathfinder Project is discussed in terms of core construction and control. A new design of the KE-ACF plant and a number of other gas-cooled types which were discussed at the ORNL information meeting are reviewed. (W.D.M.)

15813

DIRECTORY OF NUCLEAR REACTORS. VOL. 1. POWER REACTORS. Vienna, International Atomic Energy Agency, 1959. 219p. $3.50.

Details of reactor projects, for the purpose of producing electric power, were assembled, analyzed, and arranged. All the data were either provided or reviewed by authorities in the member states concerned. The basic criterion for the selection of reactor projects was that the reactors must be in regular operation and producing electric power by the end of 1962. Reactors with an output under 2 Mw were not included. Ninety-six reactors are listed. (A.C.)

15814

NUCLEAR REACTOR COMPONENT CLADDING MATERIAL. J. E. Draley and W. E. Ruther (to U. S. Atomic Energy Commission). U. S. Patent 2,871,176. Jan. 27, 1959.

Fuel elements and coolant tubes used in nuclear reactors of the heterogeneous, water-cooled type are described, wherein the coolant tubes extend through the moderator and are adapted to contain the fuel elements. The invention comprises forming the coolant tubes and the fuel element cladding material from an alloy of aluminum and nickel, or an alloy of aluminum, nickel, and iron. The amounts of nickel and iron present in the alloys are selected to prevent intergranular corrosion of these components by water at temperatures up to 350°C.

15815

HOMOGENEOUS NUCLEAR REACTOR. R. P. Hammond and H. M. Busey (to U. S. Atomic Energy Commission). U. S. Patent 2,874,106. Feb. 17, 1959.

Nuclear reactors of the homogeneous liquid fuel type are discussed. The reactor is comprised of an elongated closed vessel, vertically oriented, having a critical region at the bottom, a lower chimney structure extending from the critical region vertically upwardly and surrounded by heat exchanger coils, to a baffle region above which is located an upper chimney structure containing a catalyst functioning to recombine radiolytically-dissociated moderator gases. In operation the liquid fuel circulates solely by convection from the critical region upwardly through the lower chimney and then downwardly through the heat exchanger to return to the critical region. The gases formed by radiolytic-dissociation of the moderator are carried upwardly with the circulating liquid fuel and past the baffle into the region of the upper chimney where they are recombined by the catalyst and condensed, thence returning through the heat exchanger to the critical region.

15816

PUSH-PULL POWER REACTOR. D. K. Froman (to U. S. Atomic Energy Commission). U. S. Patent 2,875,143. Feb. 24, 1959.

Power generating nuclear reactors of the homogeneous liquid fuel type are discussed. The apparatus utilizes two identical reactors interconnected by conduits through heat exchanging apparatus. Each reactor contains a critical geometry region and a vapor region separated from the critical region by a baffle. When the liquid in the first critical region becomes critical, the vapor pressure above the fuel is increased due to the rise in the temperature until it forces the liquid fuel out of the first critical region through the heat exchanger and into the second critical region, which is at a lower temperature and consequently a lower vapor pressure. The above reaction is repeated in the second critical region and the liquid fuel is forced back into the first critical region. In this manner criticality is achieved alternately in each critical region and power is extracted by the heat exchanger from the liquid fuel passing therethrough. The vapor region and the heat exchanger have a non-critical geometry and reactivity control is effected by conventional control rods in the critical regions.

15817

NEUTRONIC REACTOR. H. Hurwitz, Jr., H. Brooks, C. Mannal, J. H. Payne, and E. A. Luebke (to U. S. Atomic Energy Commission). U. S. Patent 2,879,216. Mar. 24, 1959.

A reactor of the heterogeneous, liquid cooled type is described. This reactor is comprised of a central region of a plurality of vertically disposed elongated tubes surrounded by a region of moderator material. The central region is comprised of a central core surrounded by a reflector region which is surrounded by a fast neutron absorber region, which in turn is surrounded by a slow neutron absorber region. Liquid sodium is used as the primary coolant and circulates through the core which contains the fuel elements. Control of the reactor is accomplished by varying the ability of the reflector region to reflect neutrons back into the core of the reactor. For this purpose the reflector is comprised of moderator and control elements having varying effects on reactivity, the control elements being arranged and actuated by groups to give regulation, shim, and safety control.

TECHNOLOGY

Feed Materials

15818 RFP-127
Dow Chemical Co. Rocky Flats Plant, Denver.
SEPARATION OF THORIUM FROM URANIUM BY SELECTIVE STRIPPING FROM DIBUTYL CARBITOL. Leroy Hampton. Sept. 29, 1958. 14p. Contract AT(29-1)-1106. $3.30(ph), $2.40(mf) OTS.

An approach to the problem of separating thorium from uranium in solvent extraction process streams is described. Aqueous phosphate, oxalate, and fluoride scrub systems were compared for their ability to remove thorium from dibutyl carbitol which contained both thorium and uranium. A mixer-settler apparatus was employed for contacting aqueous and organic phases. Thorium decontamination results obtained with the use of a phosphate scrub were not encouraging. Both oxalate and fluoride scrub systems gave satisfactory results. The fluoride system was selected for application because of the relatively high decontamination factors obtained, the ease of maintaining a suitable concentration of fluoride ion, and the facility with which thorium fluoride can be isolated from the spent scrub solution. (auth)

15819
PROCEEDINGS OF THE SECOND UNITED NATIONS INTERNATIONAL CONFERENCE ON THE PEACEFUL USES OF ATOMIC ENERGY, HELD IN GENEVA, 1 SEPTEMBER—13 SEPTEMBER 1958. VOLUME 4. PRODUCTION OF NUCLEAR MATERIALS AND ISOTOPES. Geneva, United Nations, 1958. 641p. $16.50.

Detailed discussions of nuclear materials are presented. Included are preparation methods for U and Th compounds, as well as Zr, Be, and graphite. Isotopic separation methods are also examined. (J.R.D.)

Raw Materials

15820
PROCESS OF RECOVERING URANIUM FROM ITS ORES. Paul Galvanek, Jr. (to U. S. Atomic Energy Commission). U. S. Patent 2,875,023. Feb. 24, 1959.

A process is presented for recovering uranium from its ores. The crushed ore is mixed with 5 to 10% of sulfuric acid and added water to about 5 to 30% of the weight of the ore. This pugged material is cured for 2 to 3 hours at 100 to 110°C and then cooled. The cooled mass is nitrate-conditioned by mixing with a solution equivalent to 35 pounds of ammonium nitrate and 300 pounds of water per ton of ore. The resulting pulp containing 70% or more solids is treated by upflow percolation with a 5% solution of tributyl phosphate in kerosene at a rate equivalent to a residence time of about one hour to extract the solubilized uranium. The uranium is recovered from the pregnant organic liquid by counter-current washing with water. The organic extractant may be recycled. The uranium is removed from the water solution by treating with ammonia to precipitate ammonium diuranate. The filtrate from the last step may be recycled for the nitrate-conditioning treatment.

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